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# ABDOMINAL PAIN

# ABDOMINAL PAIN

BY

PROF. DR. NORBERT ORTNER

CHIEF OF THE SECOND MEDICAL CLINIC AT THE UNIVERSITY OF VIENNA

AUTHORIZED TRANSLATION BY

WILLIAM A. BRAMS, M.D.

FORMERLY LIEUTENANT-COMMANDER, MEDICAL CORPS, U. S. N.

AND

DR. ALFRED P. LUGER

FIRST ASSISTANT, SECOND MEDICAL CLINIC, UNIVERSITY OF VIENNA

NEW YORK

REBMAN COMPANY

HERALD SQUARE BUILDING

141–145 WEST 36TH STREET

20787 Mi2 70

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## Author's Preface

THE appearance of an American editicn of my book on "Abdominal Pain" is to me a source of great satisfaction because it will place into the hands of my numerous friends abroad, in their own language, a work which is the product of many years of personal experience and observation.

I hope it will be well received, and that it will be of help in re-establishing friendly relations between members of the medical profession of the English-speaking countries and of my own.

I should be very happy to believe that it will be useful, especially to those who have studied in our Viennese institutions.

N. ORTNER.

## Translator's Preface

THE translation of this volume on abdominal pain was undertaken with the desire to present the teachings of the school of Bamberger, Neusser, and Ortner in what is perhaps their best and most adequate form. The work is based upon the wide personal experience of one of the principal figures in the school it represents, and most of the diagnoses it contains have been carefully verified by surgical and anatomical procedures. The translators hope that it will fill the need for a concise and competent discussion of the subject as seen by the clinician in his daily work.

Professor Ortner has kindly consented to some slight modification in the style and to some slight condensation in order to make the material more accessible to the English and American reader.

The translation is of the second and latest edition of the work.

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## Introduction

We include in this large chapter all those diseases in which the particular complaint of the patient is pain in the abdomen. Posttraumatic affections, such as those following an accidental rupture of the spleen, etc., are not considered in this connection. Fortunately, we are seldom called upon to make a diagnosis on the consideration of the pain alone. There soon develop other and objective findings which aid us; but the pain often points out the direction we must follow in the objective examination in order to arrive at the proper diagnosis. It is one of the early symptoms and serves as a guide through the maze of possibilities, and, therefore, it seems justifiable to me to consider the pain as the starting point in the differential diagnosis.

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# ABDOMINAL PAIN

## Diffuse Abdominal Pain

### Intense, Diffuse, Abdominal Pain With Shock

Our first considerations in the presence of very severe and sudden abdominal pain of such a great intensity or overwhelming severity that the patients almost lose consciousness or believe that death is imminent are: acute intestinal obstruction, acute perforation of a diseased organ (stomach, intestine, bladder, ureter, Fallopian tube, uterus, gallbladder) and the rupture of an abscess into the free peritoneal cavity from the appendix, cecal region, liver, spleen, pancreas, etc.

Next in order is torsion of a pedicled organ such as a cystic ovary, omentum, gallbladder, Fallopian tube, floating kidney, wandering spleen or cyst of the mesentery. We must also consider torsion, contusion or fulminating inflammation of the testicle, extra-uterine pregnancy, acute strangulation of hemorrhoids, and pus or inflammation in the groin or abdominal muscles.

Another class of causes consists of severe renal colic, less often gallstone colic, pancreatic inflam-

mation, necrosis or hemorrhage of this organ, severe lead colic, acute deficiency of the adrenals as in *Addison's* disease, and tabetic or vascular crises in the abdomen.

The list of possibilities ends with a consideration of extraabdominal conditions, such as subdiaphragmatic angina pectoris or hysteria.

Another symptom, ileus, may accompany the intense initial pain in the aforementioned diseases, except in the rupture of an organ, subdiaphragmatic angina pectoris, and acute adrenal insufficiency. In speaking of ileus in this connection, I do not mean that one must wait for fecal vomiting. Although this is a cardinal sign, it is not an early one. I do wish to emphasize the importance of the early symptom complex of complete obstruction of the bowel as betrayed by inability to pass feces or flatus per rectum.

To be sure, this symptom of ileus cannot bear too much weight during the first few hours of the illness, as it may be present in conditions other than those mentioned here or it may clear up very soon and not be a result of obstruction of the bowel. We may say that ileus is present when the passage of flatus is uninterruptedly absent for some hours, at least twelve, and during which time, of course, no feces are passed.

The following discussion will be based on the question: what diseases are to be considered when the patient complains of a sudden anni-

hilating pain in the abdomen, with no passage of feces or flatus for several hours, with repeated vomiting accompanying the initial pain, the vomitus containing urobilin with many colon bacilli and, subsequently, fecal vomiting in the later course of the disease? The presence of urobilin and many colon bacilli in the vomitus of early ileus is an important but not characteristic finding of this condition.

## Severe, Diffuse Abdominal Pain, with Shock and Ileus

Acute intestinal obstruction in all its forms deserves first mention, but not all these cases show the intense degree of pain which is under discussion. It is present only in those cases in which the obstruction of the lumen is accompanied by a strangulation of the mesentery, with a resulting pulling or tearing of the mesenteric nerves and interruption of the circulation. This occurs in complete torsion or noose formation of the bowels, intraabdominal incarceration, occasionally in simple bowel occlusion resulting from kinking at a site of adhesions, and in some cases of intussusception.

The overwhelming character of the pain is, however, absent in simple cases of obturation, as by gallstones, foreign bodies, intestinal parasites, or fecal masses. In a like manner, the extreme degree of pain may also be absent in some

cases of kinking, intussusception, and sudden compression of the bowel from without, as by a wandering spleen or some other wandering organ.

The before-mentioned type of severe pain is not seen in the cases of acute obstruction which occur as the result of a previously existing chronic obstruction of the bowel. Cases in which there is a kinking of the mesentery or sudden incarceration by peritoneal adhesions may, however, cause very severe pain.

As previously mentioned, strangulation is characterized by the intense degree of pain which it produces. Generally speaking, the intensity of the pain is much more marked in obstruction with strangulation of the small bowel than with that of the colon. The severest pain is observed in cases of internal incarceration. Torsions, which occur chiefly in the large intestine, are not characterized by such very severe and overwhelming pains. Invagination of the large bowel, on the other hand, produces pains of almost the same intensity as those produced by obstruction of the small intestine. The pain in strangulation is continuous as a rule, with many remissions and exacerbations. This feature is absent, however, in the very acute and rapidly fatal cases of intestinal obstruction. Complete intermission of the pain is very much more rare and occurs only in cases where the invagination or torsion was

incomplete and the process has partly returned to the normal state. This latter type of intermittent colic is caused by the strangulation and stronger peristaltic contractions. The longer the crampy pains continue, the more severe they become, except in those cases which are complicated by peritonitis and collapse, where the pain may even disappear entirely. The pain in strangulation consists of two components, one which is continuous and another which consists of a wave-like increase followed by a decrease of the pain. This latter wave-like pain lasts but a few minutes but is repeated many times.

The pain in strangulation, is not, as a rule, always definitely localized, and a circumscribed area of tenderness is also often absent. This absence of distinct localization is of very great diagnostic value in differentiating strangulation from renal or gallbladder colic, or from pancreatic pains. The most striking feature of a strangulation pain is its general effect on the body in producing collapse, anxiety, acceleration of the pulse rate after the initial bradycardia is gone, the incomplete filling of the peripheral vessels, pinched facies, hollow voice, cold extremities, cold sweats, and, occasionally, a subicteric tinge. All these are absent in pure occlusion.

The characteristic criteria of intestinal obstruction in general will now be discussed. The most important signs are inability to pass feces

or flatus and the presence of a high, metallic sound on percussion or auscultation of the intestines. In addition, there is the initial reflex vomiting which is followed by an intermission of several hours and then by fecal vomiting; finally, there is albuminuria and anuria. Fecal vomiting may not appear at all in those cases of very acute strangulation ileus which are attended by an early fatal ending. Visible peristalsis or stiffening may also be absent. A strand of strongly contracted bowel may sometimes be palpated at the site of the strangulation in the early stages. In other cases, we may see the peristaltic movements of the segments of bowel, proximal to the obstruction, even in the early stages. These peristaltic waves are characterized by the fact that they all stop at a fixed point and do not produce a gurgling sound, a finding which means that the peristaltic contraction is not strong enough to force the contents through the obstruction.

We sometimes find a local meteorism of the strangulated, fixed, and motionless loop of intestine, a sign described by *Wahl-Schlange's* sign may be present and is produced by percussing the segment of bowel above the obstruction, whereupon this distended loop shows visible or palpable peristaltic contractions. Both these signs may be absent if there is diffuse meteorism above the site of obstruction or when the ob-

struction is located in an inaccessible place, such as deep in the abdomen, along the spine, or in the pelvis.

Another sign which is often present but difficult to demonstrate, is the early appearance of fluid, as shown by dullness in the flanks. This fluid resembles that found in a hernial sac, or it may even be hemorrhagic. Finally, there is a disappearance of the liver dullness in the presence of a high grade meteorism with tension of the abdominal walls, a finding which is not seen in the early stages of obstruction ileus.

It is difficult to differentiate the several varieties of obstruction in which there is also strangulation. This is especially true in the differentiation of volvulus from incarceration. It is easy to distinguish between them if the latter is an external incarceration, even if the symptoms continue after apparent reduction of the incarceration. The differentiation is more difficult, if not impossible, between an internal incarceration and a kinking of the bowel with strangulation. In general, it may be said that an internal incarceration is the more probable if there is a history of previously existing peritoneal adhesions. The location may also give us a hint of the underlying cause, as we know that internal incarceration occurs almost always in the ileum, very rarely in the jejunum, or colon, and never in the duodenum or rectum.

In strangulation of the large bowel, the greatest possibility is volvulus. Incarceration of this part is rare, while torsion of the sigmoid flexure is more common at this place than in the small intestine.

When two different portions of the bowel are simultaneously involved in a knot formation, the most frequent combination is ileum and sigmoid, rarely between two loops of small intestine, and only exceptionally between a loop of the small intestine and cecum or colon ascendens.

Strangulation of the sigmoid flexure is characterized by massive distention of the lower part of the left abdomen, with a high tympanitic or even metallic percussion note over this region. It is also characteristic of this condition that the distention becomes very great in a short time, reaching over to the upper right quadrant, and filling the entire abdomen in two or three days. It may be very difficult to determine whether this diffuse and extensive meteorism in the late stage is due to simple distention or peritonitic meteorism. Another sign which points to strangulation of the sigmoid is tenesmus, especially when accompanied by early vomiting which is not fecal. Both these signs may be explained by the low site of the obstruction.

Volvulus of the sigmoid flexure occurs, generally, in people of about 50 years of age. The course is comparatively mild in spite of the high

degree of meteorism; the initial collapse is not very marked, and the symptom complex of ileus is not complete, as there is, occasionally passage of flatus. It often occurs after a dietetic error, such as after eating food which causes extreme distention. In rare cases we may observe bloody stools without fecal contents, a finding explained by the fact that the lesion is very low and that hence there are no feces in the distal part of the intestine. These bloody stools speak against incarceration.

Volvulus of a congenitally large sigmoid is characterized by the appearance of meteorism, at first in the center of the abdomen, and later in those places where the loops, which are at first located in the midline, eventually happen to shift. Subsequently, the tympanites extend to the right and to the upper left quadrant, pushing the small intestines into the left lower quarter, a position which is the contrary to that of the normal state.

Volvulus of the small intestine is characterized by the contrast between the degree of vomiting and of the meteorism. In volvulus of the large bowel, the meteorism predominates, while in this affection of the small intestine, the vomiting is profuse, and the meteorism is rather moderate, providing that there is no complicating peritonitis. Meteorism may even be absent in volvulus of the small bowel if the course is rapidly fatal. The meteorism is located chiefly in the

middle and upper part of the abdomen, and there is absence of tenesmus or bloody stools, as described under volvulus of the sigmoid. Furthermore, the vomiting and the entire course is very stormy in volvulus of the small intestine, while the vomiting in case of volvulus of the sigmoid is comparatively mild. It may furthermore be mentioned that a short period of relief following the vomiting speaks for involvement of the sigmoid and rather against volvulus or incarceration of the small bowel.

It is very difficult or even impossible to distinguish between volvulus and incarceration of the small intestine. Generally speaking, internal incarceration of the small bowel, especially of the ileum, is more frequent than volvulus of this region. Passage of gas or feces several days after the onset of the acute obstruction speaks rather for volvulus of this portion of the bowel than for incarceration. In incarceration, there is, on the contrary, immediate cessation of passage of gas or feces, due perhaps, to a reflex paralysis of the intestine. Pain which is limited to the back, or which is more severe in this region than in the anterior surface, speaks for volvulus of the small bowel. This pain may perhaps be explained by a pulling or tearing of the mesentery at its attachment near the spine. The pains in cases of internal incarceration, when they are at all localized, are found chiefly in the umbilical

region, as this place corresponds in a general way to the location of the small intestine. The pain is rarely limited to other regions, as to the site of the incarceration. The pain may even be found in a region not at all corresponding to the site of the obstruction.

I wish to emphasize the point that bloody stools are practically never seen in internal incarceration and have no connection with this type of obstruction of the small bowel. It is, however, just this appearance of bloody stools which can be of great use to us in the differentiation between acute intussusception with signs of strangulation and the various other types of intestinal obstruction with strangulation. Bloody stools are practically always absent in cases of incarceration, are rare in cases of volvulus or obstruction by a foreign body, but are present in about eighty per cent. of cases of intussusception. The reason for the presence of blood, or blood and mucus, in the stools of the latter condition is that the exposed mucosa of the invaginated portion and of the outer covering segment of bowel continue to shed blood and mucus. This apparent passage of blood and mucus may continue even if nothing passes the actual site of obstruction. On the other hand, there is no such bleeding mucosa distal to the site of obstruction in incarceration, and, furthermore, the actual obstruction is usually complete.

The ileocecal region is the most frequent site for intussusception in children, while invagination of the small bowel above this location is more rare. In adults, both regions are involved with the same frequency and are usually caused by benign tumors, such as polyps. Intussusception of the colon is much less frequent. It is also evident that tenesmus is not uncommon in acute intussusception because of its low location at the cecum. Tenesmus is, however, nearly always absent in invagination of the small bowel. Vomiting does not often occur in these conditions and the meteorism is, as a rule, moderate. The chief diagnostic feature in intussusception is, however, the finding of a palpable tumor, the consistency of which may be felt to change during its intermittent contractions. One finds a tense, elastic, sausage-shaped tumor which may disappear in a few moments when the pains and contractions diminish. The tumor may occasionally remain permanently and is usually to be found in the region of the cecum or sigmoid, or in the rectum. Another sign which is of value is cyanosis of the anal region. This sign does not occur in carcinoma of the rectum or in dysentery, two conditions which may be confused with intussusception.

Another condition which has to be considered is a combination such as the appearance of an acute internal incarceration in the course of a previously existing, chronic obstruction of the

large bowel. The diagnosis may be made by considering the sequence, that is, the appearance of symptoms of an acute obstruction in the presence of a chronic obstruction. If the chronic obstruction is in the large bowel and the acute disease in the small intestine, there will then be a shifting of the meteorism from the flanks to the new location around the umbilicus. The change in the location of the pain may also prove of value in the diagnosis.

Acute obstruction may show relapses or repetitions, but these must not be confused with the exacerbations of a chronic obstruction. Recurrent attacks of acute obstructions often cause repeated attacks of colic lasting twelve to twenty-four hours and recurring at intervals of two to three days. The picture of obstruction is often incomplete. The appearance of bloody, or bloody and mucous, stools speaks for subacute intermittent intussusception. The underlying cause for acute, intermittent, that is, repeated obstruction with complete ileus, may be a recurrent volvulus of the sigmoid or recurrent internal incarceration following a previously spontaneous reduction. The case may be true of a recurrence after spontaneous return to normal of a kinking, torsion, or neoplasm of the intestine.

Furthermore, we must consider a spontaneously healed intussusception which is followed by a

circular scar and which later produces an acute or chronic stenosis. Another cause of intermittent stenosis may be the presence of a movable tumor, such as a mesenteric cyst, which may periodically compress the bowel or cause torsion.

We must think of the possibility of foreign bodies occluding the bowel, such as gallstones, a clump of ascares, or a fecolith, when complete relief follows attacks of ileus, and when these attacks recur at intervals of weeks or months.

A perforation of one of the abdominal organs, rupture of a hydronephrosis, the so-called apoplexy into the perirenal tissues, or the bursting of an abscess into the free peritoneal cavity will produce severe, overwhelming pains in the abdomen, with shock. The pains and shock will be as severe as in strangulation. If an abscess ruptures into a previously walled-off space, the pains will be less severe, and the general effect on the nervous system will be much less marked. It is the initial shock which characterizes perforation into the free peritoneal cavity. The appearance of perforative peritonitis which occurs in from four to twelve hours may change the picture to one of paralytic ileus, and this condition may closely resemble a strangulation ileus.

The diagnosis of a perforation ileus is difficult only when there is no history of a previously existing cause, such as peptic ulcer, etc. The diagnosis of a perforation may be made on a his-

tory of an acute, severe pain, persisting for one or more hours, and the presence of a board-like rigidity of the abdominal muscles, two phenomena not often seen in strangulation unless we are dealing with an acute intussusception. The intense shock may occasionally lead to absence of muscular rigidity and may even produce a flabbiness of the abdominal walls. We must also remember that the degree of muscular rigidity depends in great part upon the inherent muscular power, being less in multipara or in patients with ascites or certain nervous diseases. Furthermore, it has been especially observed that muscular rigidity is absent in perforation of a pyloric carcinoma. The degree of pain may also vary in the same way and under the same conditions that cause the variable degrees of rigidity.

Early, generalized tenderness, especially if elicited by very light percussion, speaks for perforation peritonitis and against strangulation. Tenderness is also much less marked in the latter condition, or may even be absent, only two types of strangulation may be accompanied by moderate tenderness, these being internal incarceration of a few days' duration or torsion followed by rapidly developing meteorism.

Local meteorism or an asymmetrically distended abdomen with bulging in circumscribed areas speaks for strangulation. The meteorism in perforation peritonitis is, however, symmetri-

cal. Further differential points in favor of strangulation are the presence of the previously mentioned *Wahl's* and *Schlange's* signs.

Just as the patient with peritonitis presents diffuse abdominal tenderness, so will he also complain of continuous or nearly continuous pain. On the other hand, the pain in acute intestinal obstruction is periodic with intervals of relief. We must not be misled, however, by the period of relief which separates the initial pain of the perforation from the subsequent pain of the resulting secondary peritonitis. This is especially likely when the perforation occurs into a previously walled-off space, and it may occasionally occur also, in perforation into the free peritoneal cavity. The peritonitis patient remains perfectly quiet, he avoids all changes of position, keeps his lower limbs drawn up and motionless, and avoids any movement of the diaphragm, such as coughing or deep breathing. The patient with strangulation is not so careful, a change in position does not increase the pain. Coughing and sneezing may increase the pain in strangulation, but even then abdominal breathing is possible as long as there is no extensive meteorism.

Another diagnostic sign of perforation peritonitis or other types of peritonitis is the absolute quiet in the abdomen on palpation or auscultation, with no sign of peristaltic movements. On the other hand, cases of strangulation do show

peristaltic movements, but I should like to add that, according to my experience, weak peristaltic movements may be heard and palpated even in case of diffuse purulent peritonitis with or without perforation; even after several days have passed it is evident, therefore, that only the negative finding is decisive, while the positive finding is unreliable.

Fever of mild or considerable degree during the first few hours after the onset of the pain with vomiting, speaks rather for peritonitis; but fever later in the course bears no such differential value, as peritonitis sets in very early and very easily in strangulation. Determination of the axillary and rectal temperatures at the same time may greatly aid us in these cases. If the rectal temperature is two degrees or more higher than the axillary, it is an almost certain sign of peritonitis. Absence of this difference, or the presence of a subnormal temperature, is a finding of no value from a negative point of view and may be seen at any stage, even in cases of peritonitis.

Furthermore, severe, continuous vomiting speaks for peritonitis, while there is, usually, a period of rest between the initial vomiting in ileus and the subsequent emesis. This must not be considered as characteristic, because there are some cases of peritonitis in which such a pause is present and may extend over a number of days.

Ischuria, difficult and painful urination, and painful strangury speak rather for peritonitis than for acute obstruction of the bowel, but these signs are not characteristic for either peritonitis or obstruction when they occur in the pelvis, as both conditions in this region may produce urinary symptoms.

Pneumoperitonitis occurs when air enters the peritoneal cavity. Its recognition is, however, easy only when large quantities of air enter rapidly. In these cases we find a tympanitic percussion note which is of the same quality all over this area. Auscultation also reveals the absence of any sound such as intestinal gurgles or splashing over a large area. Both these findings are especially to be seen over the anterior and lateral surfaces of the liver, and the absence of intestinal sounds is best determined by listening over the axillary surface of the liver while the patient is on his left side. When but a small quantity of air escapes into the free peritoneal cavity, it tends to collect over the median portion of the liver and may be distinctly different in note from the surrounding tympany of the stomach and intestines. We must be very careful, however, not to confuse this circumscribed collection of air in perforation with the localized meteorism sometimes seen in obstruction. This applies especially in cases where the colon lies in an unusual location as, for instance, in the case of a congenitally

long colon which may lie in front of the liver. We must keep in mind that the air bubble in the free peritoneal cavity will seek the highest level and we must, therefore, turn the patient on his left side in order to look for this air bubble on the axillary surface of the liver; a sign which is not found in intestinal tympanites. We must also bear in mind the possibility that this air bubble will not shift its location if there are adhesions between the liver and the abdominal wall. *Traube's* sign may also, according to my experience, be relied upon; it consists of finding a doughy consistency in the epigastrium in cases of pneumoperitoneum. According to my observation, in cases where the perforation is closed, the distended epigastrium goes down after a few days, while the surrounding parts still remain distended.

The general, paralytic meteorism which occurs in acute, and especially in subacute, peritonitis is characterized by the previously mentioned absence of appreciable intestinal sounds or of peristalsis or stiffening, and the entire abdomen shows a diffuse, high grade distention. The diaphragm is pushed upward as high as possible, so that the borders of the area of cardiac dullness are completely gone, and the area of pulmonary resonance is somewhat diminished, phenomena which are only really found in this form of intestinal obstruction.

The diagnosis of acute peritonitis may, furthermore, be made on the demonstration of an exudate. A fibrinous exudate may manifest itself by a friction rub over the liver or spleen, while dullness in the flanks speaks for a fluid exudate. Of course, we can hardly expect to find these signs in the early stages of perforation before a demonstrable peritonitis has set in. However, even if a fluid exudate already exists, we may not be able to make use of it for diagnostic purposes if the tension of the muscles in the early stages, or the meteorism in the later stages interfere with the manifestation of dullness in the flanks. Furthermore, flank dullness occurs also in cases of pancreatic necrosis, some cases of acute strangulation ileus, internal incarceration, and especially in volvulus where venous stasis of the twisted mesentery occurs. In addition, we may find flank dullness in cases of intestinal obstruction in which the loops of bowel themselves contain fluid and air. In these cases, the fluid will tend to gravitate to the most dependent portions of the lateral parts of the abdomen, both in the large and small intestines. The difficulty is increased because the fluid will change its level with change of posture, but we may be able to recognize intraintestinal fluid by producing a splashing sound in the bowel upon sudden, deep thrusts with the fingers, by the fact that the fluid is limited to, or is greater on one side than on the

other, and by finding that the dullness in the flanks extends to a higher level than in the suprapubic region. Finally, we may puncture the abdomen if the necessity is really great, and we will find pus in peritonitis and intestinal contents if we are dealing with intraintestinal fluid. We must not forget that solid intestinal contents may accumulate in the lateral regions when the bowel is obstructed. These cases show practically no change upon change of posture.

An exudate which is encapsulated by fresh adhesions may not show any change upon change of position and may thus simulate accumulated intraintestinal contents, the fecal masses may be differentiated by the fact that in the case of solid intraintestinal contents, the fecal masses may be palpable, the consistency of these masses is doughy, the shape remains altered after the pressure is removed, the dullness is found chiefly in the left side and hardly at all in the dependent portions of the right side; finally by the effect of emptying the bowel.

Dullness in the flanks may also be caused by empty, contracted loops of bowel. The dullness in these cases is also usually unilateral and hardly changes its location upon change of posture.

We may suspect an exudate in those cases which show no flank dullness when we find various zones of dullness between zones of tympany.

This is not pathognomonic, but should awaken our suspicion of the presence of an exudate.

We often find a peculiar sweetish or aromatic odor from the mouth of patients with purulent peritonitis, a sign which is absent in obstruction unless there is a co-existing paralytic ileus. Early, high grade indicanuria speaks against obstruction of the colon, but not of the small intestine. Early and marked polynuclear leucocytosis as well as an early polynuclear leucopenia speak for peritonitis. Another differential point between acute strangulation ileus and perforative peritonitis is the fact that we may observe in the latter at least the passage of flatus, while no such passage is present in strangulation ileus.

It must be remembered that air in the peritoneal cavity is not pathognomonic of a perforation, as this may be due to the presence of gas-producing organisms in the pus of cases of peritonitis, due to causes other than perforation. The pain in the latter types of peritonitis is not, as a rule, as sudden in onset as in perforation peritonitis. If we see a case of perforation peritonitis at the very onset, we may observe a sudden appearance of the before-described air bubble which may later disappear by absorption; while in cases where the gas is due to the presence of gas-producing bacteria, the development of gas is slower but is progressive.

The diagnosis of the septic type of peritonitis

is made on the presence of severe signs of intoxication. The predominance of the septic features may be so great, and the local findings may be so mild, that a diagnosis of sepsis will be made without even suspecting this type of peritonitis. The usual signs of sepsis seen in these cases are pinched face, dry and trembling tongue, cold extremities, a very rapid and thready pulse, and the presence of various types of fever, or even of a subnormal temperature. There is early clouding of the sensorium, euphoria or delirium, and, rarely, coma. A characteristic sign of septic peritonitis is continuous diarrhea with often ten or more bowel movements daily. The most common form of this type of septic peritonitis is that following puerperal sepsis. The pains in septic peritonitis may be mild or even absent, a fact which is very striking when we consider the severity of the accompanying toxic symptoms. This feature, coupled with the absence of a definite initial pain, distinguishes it from other types of peritonitis and from acute strangulation ileus. Furthermore, the diagnosis is supported by a polynuclear leucocytosis or even leucopenia, in which the polynuclears, especially the young forms, are relatively increased; there is also enlargement of the spleen and a causative focus of inflection. The finding of the bacteria in the blood will also be helpful.

Perforation into a space previously walled off

by adhesions may occur in two different forms. The initial pain and shock may be followed immediately by signs of local peritonitis, or there may be a period of intermission between the initial pain and the subsequent peritonitis. This intermission may also occur if an empty stomach, gall-bladder or appendix perforates into the free abdominal cavity. In either case, the patient may even feel well enough to work during this intermission. The combination of initial pain with shock followed by a period of remission, and subsequently by a return of the pain, is a sequence usually absent in strangulation ileus. The few instances of strangulation ileus which may show this intermission are an acute intussusception developing into a subacute form, a partial torsion, or an internal incarceration which is spontaneously reduced. The differentiation between localized peritonitis and strangulation ileus is furthermore made on the determination of *Wahl's* and *Schlange's* signs in these cases of ileus. Care must be taken not to mistake a local bulging of gas in cases of localized peritonitis, for the previously mentioned signs. This localized collection of air can often be made to disappear on pressure, a change which does not occur in *Wahl's* or *Schlange's* signs. The other general signs already described under general peritonitis may also occur in the localized form.

The blood findings as previously noted, will

help to clear up the diagnosis between these conditions, while the state of the temperature is of much less value. In some cases, especially in those with a very rapid course, we may find a subnormal temperature with rapid pulse. The higher state of the temperature per rectum in comparison with that found in the axilla, when there is about two degrees' difference, will also speak for peritonitis. Finally, we can make use of the urinary findings in a small number of cases. A marked indicanuria soon after the onset, that is, on about the second day, speaks against a strangulation ileus of the colon, providing the intestines were normal before the onset of the present trouble. When a marked indicanuria is present, it will be necessary to distinguish only between an acute strangulation ileus of the small bowel and circumscribed perforation peritonitis.

Absence of all peristalsis on auscultation and palpation speaks rather for a localized peritonitis, but this absence must be complete, if it is to be of differential value. Unfortunately, cases of such a complete absence of peristalsis are rare.

The difficulties are almost insurmountable when an acute peritonitis exists in the terminal stages of strangulation ileus. The peritonitis may result from the bursting of an ulcer in the stretched walls, the perforation of a decubital ulcer which was caused by pressure of a con-

tained foreign body, the wandering of bacteria through the paralyzed intestinal wall, an occurrence which is impossible in a normal bowel, or a similar condition at the site of strangulation, or as a result of very extensive nutritional change in the wall such as occurs in intussusception.

If we find a sudden diffuse tenderness of the entire abdomen in a case previously examined and diagnosed as ileus, we may justly suspect the occurrence of a complicating peritonitis, especially if there is a rise in temperature, where, formerly, there was no fever and where there is a marked increase in the polynuclears. The same is true in cases of internal incarceration of the small bowel, with moderate meteorism which suddenly develops a high grade distention with diffuse tenderness of the abdomen. The diagnosis of this double disease is almost impossible if we see the case for the first time in the late stages. We can make a diagnosis only of peritonitis in these cases. Occasionally, the history may help us to determine that a chronic stenosis was present, but we will be unable to say whether the present peritonitis is due to an acute exacerbation of a chronic obstruction followed by peritonitis, or to infection of the peritoneum through a decubital ulcer of the bowel in chronic obstruction.

We must also remember that a circumscribed peritonitis may cause a stenosis or even a strangu-

lation of the bowel. This may occur, for example, when a periappendicial abscess compresses the ileum or the rectum in the pouch of *Douglas*. The latter condition may be recognized by palpation of the mass per rectum. We also see stiffening and peristalsis in such cases as well as tenesmus, passage of considerable slime from anus, and, later, a patency of the anal opening due to paralysis of the anal sphincter. But the picture is not always as complete as presented. The patient may develop an acute circumscribed peritonitis around the appendix or an empyema of the gallbladder. This circumscribed peritonitis may exist for some time, after which the patient suddenly develops a picture of acute ileus with collapse. We deal in these cases, not with a mechanical ileus, but one of a paralytic nature, due either to spread of the peritonitis or to a bursting of the abscess. The board-like rigidity, the flat or concave abdomen, the diffuse abdominal tenderness, and the other usual signs of peritonitis will aid us in the diagnosis.

In cases of stenosis due to adhesions or compression, and where the onset is very sudden, the symptoms of obstruction may so overshadow those of the peritonitis, that the latter may be entirely overlooked unless the temperature and blood count are carefully watched.

There is another type of combination of peritonitis and obstruction. A localized, fibrinous

peritonitis often occurs at the site of a previous hemorrhage which was caused by an injury to the abdomen by some blunt object. This type of peritonitis causes severe localized pains with vomiting, which, however, disappear in one or two days. Pain, vomiting, acute collapse, and finally fecal vomiting appear after a few hours of apparent relief. The autopsy reveals a fresh peritoneal adhesion which has caused an internal incarceration of an intestinal loop. Cases are known in which a long time, even years, have elapsed between the original posttraumatic peritonitis and the subsequent formation of the connective tissue adhesions which caused the obstruction. The diagnosis of these conditions is made on the finding of signs of local peritonitis, immediately following a trauma with a subsequent appearance of evidences of intestinal obstruction at a later period.

We occasionally see cases of very acute appendicitis which run a very severe course, and which show such signs of obstruction of the bowel as fecal vomiting, etc. These cases terminate fatally in a few hours, with severe brain symptoms. We find, on autopsy, a slight inflammation of the appendix and a phlegmonous involvement of the retroperitoneal tissues. It is evident that these cases die from general sepsis. Septic intestinal paralysis develops, and the picture of ileus appears early in the course.

Ileus may also be caused by adhesions from a previous appendicitis. The obstruction may be due to adhesion of the intestinal loops, kinking, knotting, or fixation to the bottom of the pelvis. Adhesion of the intestinal loops may also follow an operation for removal of the appendix. We may or may not observe the initial shock in these cases.

I wish to describe a form of localized bowel paresis, that is, a paresis limited to a portion of the intestine. This occurs in the vicinity of the diseased focus, and is caused by local edema of the intestinal wall. This condition may occur in appendicitis, but it appears later in its course and not at its onset.

A sudden, overwhelming pain in the abdomen, usually always colicky in nature, with vomiting, accompanied by collapse and, in a certain percentage of cases, by signs of strangulation ileus, such as inability to pass feces or flatus, and, finally, the presence of fecal vomiting, must remind one of an acute interruption of the circulation of an intestinal blood vessel, especially of the upper mesenteric vessels. This interruption may be due to a thrombosis or embolism of the superior mesenteric artery, or to a thrombosis of the mesenteric veins. Sometimes there is an accompanying bleeding from the bowel, a finding which is of importance in the diagnosis. We have other diagnostic points by which to distinguish this dis-

ease from acute intestinal obstruction, even if there is no hemorrhage.

I mention here, among other signs, a noteworthy finding on palpation. Unfortunately this sign occurs in only a minority of the cases of infarct of an intestinal loop, though it may also occur in cases of acute intestinal obstruction. This sign consists of one or more indistinct and tender tumor masses which show no contractions or movements of any kind, and which usually give a dull sound on percussion. In addition, we find a possible source for an embolus, such as an endocarditis, or a reason for a thrombosis of the mesenteric vessels, such as arteriosclerosis. The occasional cases of acute intestinal obstruction which may present similar masses are those of internal incarceration in which the involved loops, either empty or filled with blood, appear as vague, tender tumors, about as large as a fist, and over which there is a dull sound on percussion. This finding closely resembles the one described at the beginning of this paragraph under embolus of the superior mesenteric artery. It is furthermore possible to confuse this finding with an intussusception because the findings on palpation may be nearly alike, and, in addition, there may also be bloody diarrhea. But even here, the diagnosis will not be too difficult. In intussusception, we find a single sausage-shaped tumor which is capable of showing contractions,

while embolism or thrombosis produce several masses of intestinal loops which are dead.

Furthermore, I may add that, according to my experience, the abdomen may show an exquisite, local tenderness in some cases of embolism of the superior mesenteric artery. This tenderness may lie over the site of the infarcted loop of intestine and is, perhaps, due to an involvement of the serous covering of the bowel. The difficulties in the diagnosis will be increased as the case progresses, because gangrene and peritonitis ultimately appear. The diffuse tenderness and rigidity will usually be considered as being due to a complicating diffuse peritonitis.

Fluid in the peritoneal cavity may also be found even in the early stages of embolism of the mesenteric artery. The presence of colicky pains speak very strongly for embolism rather than for peritonitis.

The clinical picture of embolism of the superior mesenteric artery and of thrombosis of the mesenteric veins are quite similar, especially if the latter sets in rather abruptly. These cases show sudden hemorrhage from the bowels which is sometimes associated with hematemesis, sudden intense, colicky pains, collapse, vomiting, marked distention and tenderness of the abdomen, and obstipation or, perhaps, diarrhea. The differentiation from an acute intestinal obstruction or from acute peritonitis will often be impossible.

We will think of a thrombosis of a mesenteric vessel when we find malena or a possible cause for a thrombosis, such as a preexisting ulcerative or inflammatory condition of the bowel, which may lead to a phlebitis with resulting thrombosis. Other causes are a diseased portal circulation, failing heart or arteriosclerosis of the intestinal blood vessels.

A similar picture, but without the outspoken signs of ileus, occurs in sudden obstruction of the portal vein. When the obstruction in the portal vein is complete and rapid, the patient complains of a sudden, intense, diffuse abdominal pain, not infrequently associated with collapse, vomiting, and meteorism, in short, much like the picture one sees in acute peritonitis. There are additional signs, however, which may enable us to recognize this acute pylethrombosis. The patient has, above all, bloody diarrhea, in which the hemorrhage may be occult or manifest, at times icterus and a diffuse abdominal tenderness which is most exquisite over the portal vein. A collateral Caput Medusæ develops, severe cases may bleed from the œsophagus and rectum, more rarely from the nose, stomach, intestines, and kidneys. Ascites eventually develops but may not be seen if the thrombus becomes canalized or undergoes retrogression. A tentative diagnosis can at least be made when there is also a possible cause, such

as purulent or ulcerative conditions of the bowel, compression of the portal vein by some circumscribed process in its vicinity, luetic scars of the portal vein, shrinkage of the liver, or syphilis or malaria of this organ. The suspicion of a pylephlebitis of the portal vein will be heightened when we find intermittent chills with fever and tenderness over the portal vein in the presence of the before-mentioned causes. It is evident that we are called upon to differentiate between pylephlebitis with thrombosis and acute peritonitis in the presence of intestinal inflammation or ulceration, when sudden pain with shock appears. The inflammatory or ulcerative process of the bowel which may lead to either process are acute purulent appendicitis, typhoid, and occasionally dysentery.

We have already mentioned the pedicled organs which may undergo torsion. These are a wandering kidney or spleen, ovary, tube, omentum, gallbladder or uterine myoma. This torsion may be confused with acute intestinal obstruction complicated by strangulation. Practically speaking, torsion may be ushered in with sudden, diffuse, colicky pain, collapse, often with vomiting, anxiety, abdominal distention and failure to pass feces or flatus. What is more probable than a diagnosis of strangulation?

Not infrequently, however, one or more chills accompany the attacks of cólic, a finding which

is rare in ileus. The patient's description of the attack may help in the diagnosis. For instance, a wandering kidney which is caught and held in a certain position may cause pain in the lumbar region with radiation along the ureter towards the bladder, urinary tenesmus, and, very often, tenderness on deep pressure or percussion in the region where the affected organ may happen to be located. The wandering organ may sometimes be tender when reached from the vagina or rectum. Twisting of the ureter will also cause oliguria, with abnormally concentrated urine, or there may be a reflex anuria. Sometimes there is albuminuria with an appearance of polyuria after the attack. The remarkable diminution of the total quantity of the urine is not characteristic of this condition, as it may also occur in many cases of shock due to other causes.

The diagnosis of torsion of the pedicled organs may be made on the symptoms and signs already enumerated, the location of the pain, and the rapid appearance of a tumor at the site of the trouble. Torsion of the ovary will be recognized by finding a doughy, painful mass per vaginam; a mass which corresponds to the swollen ovary. This mass is, in fact, the most reliable sign of this affection.

Torsion of the spleen is seldom seen. It occurs either as a wandering organ or when the

normal peritoneal supports are missing. The torsion itself may be caused by a sudden shaking up of the body, as in jumping or running. Signs of ileus, collapse, and secondary peritoneal symptoms are also found in these cases. The diagnosis is possible only when the nature of the displaced organ is recognized. Such a torsion may twist and untwist itself upon further brisk motion, or may twist and untwist itself several times, thus causing repeated attacks.

Extrauterine pregnancy with rupture of the sac, or a peritoneal insult caused by the abortion will be recognized by the gynecological findings, a history of missed menstruations, the presence of milk secretion, anemia, collapse, rapid pulse without fever, subsequent subicterus and the blood findings showing anemia with absence of leucocytosis.

The following points will aid in the differential diagnosis between extrauterine pregnancy and peritonitis. According to recent investigation, lessened or normal viscosity of the blood speaks for bleeding in the peritoneal cavity, while increased viscosity speaks for inflammation of the peritoneum. The urine in extrauterine pregnancy may contain urobilin or urobilogen, while peritonitis cases show an indicanuria.

The difficulties in distinguishing between a perforation peritonitis and intraperitoneal hemorrhage are greatly increased in cases of per-

foration of the gastro-intestinal tract by an ulcer with simultaneous erosion of a large blood vessel. In this instance, we see a combination of the signs of perforation and hemorrhage.

Peritonitis and intraabdominal hemorrhage may coexist if the ruptured tube of an extrauterine pregnancy is adherent to a purulent appendix. We can make use of a valuable symptom in that case, namely, the reflex muscular rigidity. This rigidity is very marked in peritonitis, and not nearly so pronounced in extrauterine pregnancy. The *Abderhalden* test for pregnancy may also be of value in distinguishing between the two diseases.

It will not be very difficult to distinguish strangulation from torsion, incarceration of hemorrhoids, crushing injury or inflammation of the testicle, or inflammations in the groin. Torsion of an undescended testicle is possible even while it is still in the abdomen or groin.

A mesenteric cyst may, occasionally, cause a tearing or kinking of the mesentery when the cyst shifts its location. The clinical signs very much resemble those of strangulation and ileus.

The diagnostician is more frequently concerned with cases of renal or gallstone colic. The severe cases may simulate acute strangulation. They may also resemble ileus by producing fecal vomiting and absence of stools and flatus. I have seen five cases of nephrolithiasis in which

very capable surgeons had performed a laparotomy for intestinal obstruction only to find that the ileus was reflex and secondary to the renal stone.

In this connection, I should like to summarize the differential points between a stenosis colic of the bowel and colic occurring in organs not of a hollow nature, such as the liver, kidney, or pancreas. Intestinal colic has a wave-like character in which the pain increases rapidly to its height and then subsides; the entire wave lasting but a few minutes; after which, this wave of intensity is repeated, but it is always separated from the foregoing and following waves by a period of almost complete relief. The colic from solid organs is continuous for hours, with, perhaps, slight variations in intensity during its course. The wave-like character, with intervals of almost complete relief, are absent in colic from solid organs, even if the duration of the pain is short.

In resuming the discussion of renal stone, I wish to point out some additional signs which help us to recognize the condition. There may be one or more chills with the onset of the attack, the pain is localized chiefly in the lumbar region or the flank, although it is sometimes found in the epigastrium or lower part of the abdomen,—the loin is tender on light percussion, and the skin over this region is hyperesthetic.

The tender ureter may be found on a line external to the navel, and the pain may radiate along the ureter to the lower extremity, bladder, or genitalia. The testicle on the affected side is tender, there are urinary tenesmus, unilateral tenderness and rigidity of the abdominal muscles, especially of the lumbar muscles, albumin, and at least a few laked blood cells in the urine after an attack. Albuminuria and casts may be found in some cases of intestinal obstruction, but red blood cells are absent. Finally, the X-ray may help to clear up the diagnosis.

Renal infarcts, especially when bilateral, or infarcts of the spleen, may set in with sudden and intense abdominal pain, with collapse and ileus. The nature of this attack may be suspected by the fact that the intensity of the pain remains the same for days, the location is constant and circumscribed, there is no radiation, there are often chills and fever, and, finally, there is an obvious source for an infarct, such as endocarditis, etc. Great difficulties may arise if there is no apparent source for an infarct.

Diseases about the kidney, such as an acute paranephritis or hemorrhage into the perirenal tissues may begin with diffuse abdominal pain and complete stoppage of stool and flatus. Hemorrhage into the iliopsoas muscle resulting

from malignant nephrosclerosis may cause a reflex, spastic, periodic ileus, with shock and diffuse abdominal pain.

I may also mention that rare cases are known in which purulent, suppurative, or hemorrhagic cholecystitis or pericholecystitis began with intense and diffuse abdominal pain, fecal vomiting, collapse and inability to pass feces and flatus. We may suspect the gallbladder when we find a rapidly appearing, tender tumor mass or tenderness in the region of the gallbladder. We may also find that the muscular rigidity is most marked in the upper right quadrant of the abdomen. Enlargement of the liver, urobilinuria, etc., are other symptoms.

Another type of intraabdominal disease which attracts our attention is acute or subacute pancreatitis, pancreatic hemorrhage or necrosis. I shall consider the three processes together under the one heading of inflammatory pancreatitis, because a clinical differentiation, intra vitam, is not possible. All of the pancreatic diseases may simulate acute strangulation or perforation peritonitis, as a result of the effect on the solar plexus and resorption of the pancreatic ferments in the blood vessels of the intestines, but chiefly by the direct effect of these ferments on the intestinal walls in causing a paralysis of the bowel with a resulting picture of strangulation or perforation. The most striking manifestations of

the above types of pancreatitis are very sudden, intense, lightning-like abdominal pains which grow steadily worse, are often diffuse, but subsequently become localized to the epigastrium. There are also vomiting which only rarely becomes fecal, marked collapse, and severe meteorism.

Of further use in the diagnosis is the fact that pancreatic inflammation and necrosis occur most frequently in very stout persons, often in those who have chronically abused alcohol, and especially in those who have an atrophic cirrhosis of the liver. These patients have frequently had attacks of cholecystitis or gallstones, or, perhaps, luetic or arteriosclerotic disease of the abdominal blood vessels.

The radiation of the pain in pancreatic disease is, according to my judgment, of great value. The patients complain of epigastric pain which radiates posteriorly, occasionally also to the left shoulder, but the characteristic manner is a fan-like radiation downwards to the hypogastrium as far down as the iliac bones, or even to the lower extremities or genitalia. In other cases, the patients complain of pain and tenderness reaching across the abdomen. This pain is constant and not wave-like, as is the case in intestinal obstruction.

An occasional but important finding is diarrhea, perhaps with pancreatic tissue in the stool.

The stools are massive and copious, a finding which is the contrary to that seen in intestinal obstruction.

Frequent and persistent vomiting of bile at the onset speaks rather for pancreatic disease than for intestinal obstruction high up. Vomiting occurs early in obstruction, but the intervals between the vomiting spells are longer, the vomitus is more copious, later contains intestinal contents, and finally becomes fecal. The vomiting of bile in pancreatitis persists throughout the course. Persistent vomiting which is constantly increasing is found more frequently in peritonitis than in pancreatitis.

The tenderness in pancreatitis is often limited to the epigastrium or may be entirely absent in this region. The abdominal muscles are not rigid, although they may be tense as a result of the meteorism, a feature which distinguishes pancreatic disease from perforative peritonitis with its diffusely rigid and indrawn abdomen with tender musculature. Other cases of pancreatic neurosis produce a generalized tension of the abdominal walls, often with diffuse distention, but even in these cases the chief localization is in the epigastrium.

We find a different picture in those cases in which an acute tumor formation has occurred as a result of inflammation or hemorrhage into the pancreas. These cases present a strikingly lo-

calized and greatly distended area in the region of the cecum, the ascending colon, and part of the transverse colon, a condition which is probably caused by compression of the transverse colon by the pancreas tumor. This sign is also of value in excluding peritonitis. *Desjardin's* point of tenderness is also of value. It corresponds to the head of the pancreas and lies about 5 to 7 cm. to the right of the navel on a line connecting the apex of the axilla with the umbilicus. We may occasionally feel areas of indefinite resistance in the epigastrium. These areas of resistance may be due to lumps of fat, necrosis in the omentum, infiltration of the gastrocolic ligament, or swollen pancreas. The most pronounced tenderness is found in the epigastrium and extends to the left lumbar region if there is extension of the inflammation to the retroperitoneal fatty and connective tissue.

I consider the following signs as of importance in the diagnosis of pancreatic disease; subicteric or pale, cyanotic color of the face, cyanosis of the abdominal skin, and urobilin, or even bilirubin, in the urine. The latter may be due to compression of the common duct by the swollen head of the pancreas or to direct damage of the liver. There is a clouding of the sensorium, restlessness, delirium, and sometimes coma if the patient survives the first 24 hours. Clouding of the sensorium, delirium, and coma are, however,

very rare in obstruction of the bowel. Furthermore, the severity of the symptoms persists in spite of the emptying of the bowel, a thing which does not occur in high obstruction, where relief is obtained even if only gas is passed. The abnormally rapid emaciation is a further sign in favor of pancreatitis.

Clouding of the sensorium also aids us to distinguish pancreatitis from peritonitis, except in the cases of severe, septic peritonitis. But even in the latter, we usually find signs of irritation, such as delirium rather than stupor or coma, which are conspicuous and lasting in pancreatic disease. An abnormally rapid course is also characteristic of pancreatic disease. The diagnosis of pancreatitis will be substantiated by the appearance of glycosuria and obstipation of several days' standing without the appearance of indicanuria. Pancreatic disease is more likely to be confused with strangulation of the small bowel than of the colon. Acute perforative or purulent peritonitis as well as small bowel strangulation show indicanuria if the course is not too rapidly fatal. We may find a surprisingly high leucocytosis in spite of the intense collapse and absence of fever. This leucocytosis speaks against pure intestinal obstruction and perhaps against perforation peritonitis. All these conditions except the glycosuria may appear in a variable degree, or may even be absent, hence the

diagnosis cannot always be made with certainty. These signs will also be useless if the pancreatitis is complicated by a secondary, fulminating diffuse or local peritonitis, local collection of pus, retroperitoneal phlegmon, general sepsis, or thrombophlebitis of the portal or mesenteric vein.

Pancreatic necrosis in which an early icterus appears may be confused with disease of the liver or biliary tracts, especially if collapse is present in the latter. The pancreatitis will be recognized by the long duration and intensity of the collapse, the absence of striking tenderness over the incisura hepatis, or the absence of a possible cause for the inflammation of thrombosis of the portal vein. The diagnosis of pancreatitis becomes clearer if we can palpate a tumor above the navel. This tumor may be due to purulent pancreatitis or to fat necrosis. The functional tests of the pancreatic activity may also aid us, especially if the course extends over weeks. The presence of sugar in the urine makes the recognition of pancreatic disease even more probable.

Pancreatic stones or cysts are chronic conditions which may produce severe colic with shock and unconsciousness, but not the signs of ileus. Pancreatic cysts may be suspected when we find a cystic tumor in the supraumbilical region which is accompanied by the above-described colicky pains. Such a recurring colic closely

resembles a recurring intestinal obstruction, especially a recurring volvulus.

I shall finish the discussion of the conditions which may resemble strangulation ileus by considering chronic lead poisoning. These cases of plumbism present very severe diffuse colicky pains in the abdomen, at least moderate collapse, constipation, and intense vomiting. The diagnosis is made on finding a markedly indrawn, rigid abdomen which is not tender on pressure, a pulse which is strikingly slow during an attack of pain, and a blue lead line on the edge of the gums. A history of the patient's occupation may also help in the diagnosis. The patient need not be a painter, but may be a worker with white felt hats, white gloves or umbrella handles, cooking utensils which are repaired with lead. Drinking cider from lead containers may also cause the disease. Further signs of chronic lead poisoning are high blood pressure, accentuated second aortic tone, and stippling of the red blood cells. The diagnosis can be made on the foregoing symptoms even in the absence of arthralgia, typical lead palsies, and changes in the joints, vessels, brain or kidney.

### Severe, Diffuse Abdominal Pain, with Shock but without Ileus

When a patient complains of unusually severe abdominal pain with a feeling of impending

death but without the signs of ileus, we must not overlook the fact that we must consider those diseases discussed in the previous chapter. Ileus is always present in intestinal obstruction and is a very important symptom of this disease, but the same symptom complex may also occur in other conditions.

A picture resembling acute peritonitis may be seen in the acute onset in some cases of *Addison's* disease, sudden blocking of the adrenal veins, hemorrhagic infarcts, apoplexy into the adrenals, or any cause leading to acute insufficiency of these organs. The patient is attacked by sudden diffuse abdominal pain, severe vomiting, singultus and pains in the calves of the legs. He appears collapsed, has obstinate constipation or diarrhea, the pulse is rapid and weak, the abdomen drawn in and concave, and the abdominal muscles rigid, and the patient dies in coma. Autopsy reveals no trace of peritonitis or disease of the organs, but a close search will reveal distinct tuberculosis of the adrenals. The diagnosis is facilitated if the patient is known to have suffered from *Addison's* disease or to have had the characteristic brownish pigmentation of the skin and mucous membranes. Some cases of *Addison's* disease have a tenseness of the abdominal muscles and of the calves of the legs. The pigmentation may not be present in very acute cases. Finally, we must not mistake pigmenta-

tion of the skin from other sources for the pigmentation of *Addison's* disease. The mucous membranes as well as the skin are pigmented in disease of the adrenals.

Sudden, violent pain in the abdomen, with collapse, followed in a few hours by death, must remind us of a rupture of an abdominal artery into the free peritoneal cavity. The vessels usually affected are the abdominal aorta or its branches, and especially a mycotic aneurism of the splenic, superior mesenteric or common iliac arteries. We will especially suspect this condition in the presence of rapidly accumulating fluid in the peritoneal cavity with anemia. The knowledge that such an aneurism existed previously will be of great help in the diagnosis.

A very important symptom of mesenteric cyst is abdominal pain which comes on suddenly, is repeated, is nearly always colicky, and is sometimes overwhelming in severity. It may occur during apparent good health or during the period of vague, chronic dyspeptic symptoms, such as vomiting, constipation, and slight pains in the abdomen. The pains and dyspeptic symptoms are caused by the change in position of the movable cyst with resulting tearing, stretching, or kinking of the mesentery. I have already mentioned that this condition may simulate intestinal obstruction by producing meteorism, vomiting, and stoppage of stools and flatus.

Tumors of the great omentum produce very similar pains, which are often located in the epigastrium. The nature and severity of these disturbances are quite similar to those produced by tumors of the mesentery regardless as to whether the growth is solid or cystic.

We have already said that we must not forget to consider the possibility of a torsion of a wandering kidney with resulting acute hydronephrosis when we believe that we are dealing with a renal colic. We must also consider some other conditions in this connection as, for instance, rare cases of perforated periappendicitis which have extended high up toward the kidney and inflammation of the appendix which lies in the retroperitoneal tissues, or some cases of acute paranephritis resulting from a rupture of a renal abscess. The patient may complain of severe, diffuse pain in the abdomen as well as of pain in the lumbar region in the conditions mentioned in this paragraph. We will be aided in the diagnosis by finding tenderness in one or both flanks, especially on deep percussion, hyperesthesia of the skin in these regions, and marked pain toward the lumbar region on deep pressure from the anterior abdominal wall. The most substantial points for the diagnosis are, however, the appearance of a swelling in the lumbar region even though it be only of mild degree, perhaps a resistance or tumor formation in this region,

eventually a redness or edema of the skin, extending even to the iliac region, unilateral muscular spasm of the long back muscles, and, according to my observation, a shortening of the distance between the tenth rib and the anterior superior spine on the diseased side.

Another disease in the kidney region which may sometimes cause diffuse pain over the abdomen with collapse, is the so-called apoplexy about the kidney region. This may occur as a single hemorrhage with a stormy onset or as repeated bleedings with formation of a hematoma in the pericapsular tissues of the kidney. At times it is caused by primary disease of the kidneys, such as carcinoma, sarcoma, abscess or tuberculosis of this organ, arteriosclerosis or preexisting interstitial nephritis, and, finally, hemorrhage of the adrenals. We may find sudden diffuse abdominal pain, early collapse, and signs of paresis of the bowel. Soon a resistant mass appears in the lumbar region which may rapidly develop into a tumor around or below the kidney, and which may be palpable in the flanks or even downwards in the iliac regions. At times, we find a transitory anuria or albumin and blood in the urine.

An appreciable rise in temperature occurs if the hematoma becomes infected or purulent. A symptom, which, in my opinion, is very important and striking, is the high-grade acute anemia,

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resembling that which occurs in all forms of internal hemorrhage. Internal hemorrhage from sources other than the pararenal region are, however, accompanied by collapse. Rupture of the liver with internal hemorrhage produces bradycardia, while rupture of the kidney shows blood in the urine. The appearance of subcutaneous hemorrhage under the skin of the lumbar region is another symptom which may aid in a diagnosis. The knowledge of a pre-existing renal lesion which may lead to such a hemorrhage may also attract our attention to the proper region.

The picture described in the previous paragraph is of importance because it shows that a retroperitoneal disease may cause diffuse abdominal pain. This is even more conspicuously shown in the case of traumatic hematoma in the renal region. These cases may cause diffuse abdominal pain with rigidity, vomiting, rapid pulse, and slight fever; in other words, pseudoperitonitic symptoms.

The abdominal or gastric crisis of tabes rarely begins so suddenly that it may be confused with the afore-mentioned conditions. Even if the crisis is the first symptom of the tabes, we may make the diagnosis on the fact that the patient has had no previous abdominal pain, that the attack lasts for days and weeks and ends suddenly, that the pulse rate and blood pressure are increased, and that the spinal fluid gives the characteristic find-

ings. Other signs of tabes may also be present. Such crises may be due to causes other than tabes, as, for instance, spinal lues, syringomyelia, multiple sclerosis, myelitis, diabetes, *Basedow's* disease, tuberculosis, syphilis, neoplasms, actinomycosis of the intraspinal roots, chronic morphinism, disease of the cœliac plexus, pancreatitis, lesions of the lesser curvature of the stomach or of the cardia, retroperitoneal glands, and aneurism of the abdominal aorta. The pains are crisis-like,—that is, they are constant in nature, begin suddenly, are severe in their course, and end abruptly, leaving the patient in an apparently good state of health.

There is one condition which we must always remember in the presence of acute abdominal pain accompanied by a feeling of anxiety. This is subdiaphragmatic angina pectoris. The pains may be in the epigastrium, over the portal vein, or in the lumbar region, with radiation to the lower limbs. There is practically no vomiting; the pains are burning or oppressive and not colicky, and reach behind the lower part of the sternum. There is no tenderness in the epigastrium or over the solar plexus, unless there is a periaortitis or arteriosclerosis of the abdominal aorta. The diagnosis will, furthermore, be made on the presence of a sensation of anxiety and precordial oppression when the blood pressure is increased, as after excitement, bodily motion,

or abuse of nicotine. The second aortic tone is accentuated and ringing. There is some arteriosclerosis of the peripheral vessels, the patient avoids all movement during the attack, there may be a history of lues or a positive *Wassermann,* especially if the patient is of the age when attacks of angina pectoris are most frequent. Furthermore, the attacks are constant in location and nature; that is, they do not proceed from the heart region at one time and from the abdomen at another, but always from the same place.

Rupture of the heart or, what is more common, rupture of the thoracic aorta, may be followed by severe abdominal pain with shock, vomiting, meteorism, and death in a few hours. Acute anemia practically never occurs. The pericardial dullness is increased, there is no abdominal tenderness, and the pains extend behind the sternum or to the shoulders, especially on the left side.

There are also some extraabdominal conditions which must be remembered. These are pneumonia, bronchopneumonia, pleurisy, empyema and pneumothorax, but especially acute diaphragmatic pleurisy. The latter is very likely to produce early and continuous vomiting, singultus, tension of the abdominal muscles, and no passage of stools or flatus. This picture is especially likely to occur in children and may resemble acute peritonitis.

Pleuropulmonary diseases of this nature produce a hyperesthesia of the skin, while there is little or no tenderness on deep pressure. There are, furthermore, increased respirations, cough, reddish color of the cheeks, full pulse, headache, and the typical, common signs as well as findings on X-ray examination.

Diaphragmatic pleurisy is characterized by tenderness along the phrenic nerve, lagging of one-half of the thorax and decrease of the abdominal tension during respiration.

Two other extraabdominal conditions which deserve mention are acute suppuration of the inguinal glands and acute incarceration of hemorrhoids. The diffuse, abdominal pain may be so severe that the patient may forget about the real cause in the groin or anus, and this may lead to the confusion of this trouble even with acute peritonitis. A careful examination will, however, reveal the true cause.

Other possibilities are poisoning with corrosive sublimate, especially when accompanied by bloody or ordinary diarrhea. The diagnosis will be simplified if there is corrosion about the mouth or if the vomitus is examined. The poisons which produce violent abdominal pains are strong acids and alkalies and acute arsenic, lead, or mercury poisoning. We must also consider the possibility of the subsequent secondary perforative peritonitis, especially in the subacute cases.

In passing, we may mention acute anthrax of the intestines, which is associated with severe abdominal pain. This disease is characterized by collapse, high grade circulatory failure, vomiting, diarrhea, meteorism, and dyspnea. The diagnosis will be made on the bacteriological findings in the feces, blood, and spinal fluid, and on the presence of blue, swollen gums.

It is not sufficient simply to diagnose the presence of one of the foregoing diseases. We must also try to recognize the immediate cause of the acute abdominal pain, a symptom which may be caused by several different factors in the same disease. A discussion of typhoid fever, as an example, will make my meaning clear. We are accustomed to associate severe abdominal pain in typhoid with perforation, but this pain and collapse may be due to a ruptured gland which has been infected with typhoid, typhoid abscess of the spleen, or purulent typhoid salpingitis. We must also remember that typhoid may begin like an acute appendicitis and may be followed by a real periappendicitis, and even by degeneration of the abdominal muscles.

## Severe, Diffuse Abdominal Pain, without Shock

When a patient complains of severe abdominal pain without shock, we must try to orient ourselves by determining the location, radiation and

character of the pain; the time of day at which it appears; repetition of the attacks; and, if possible, the immediate cause as well as influence of motion, change of posture, and the effect of pressure. We must also consider the objective findings and the associated symptoms during and after the attack. We must, furthermore remember that a localized pain may later become diffuse, and that a diffuse pain often has a point of greatest intensity.

The first condition which occurs to us in the presence of diffuse abdominal pain of this nature is acute peritonitis. The pain in this disease is rarely colicky, usually sudden in its onset, very intense, continuous, and rapidly increasing in severity, so that its very height is reached in a short time. Exacerbations or remissions are either very moderate or absent. Most of these cases will prove to be of the acute purulent type, but they may also be cases of acute tuberculous peritonitis.

The diagnosis of the purulent type will be based on the presence of fever, vomiting, singultus, difficult urination, diffuse meteorism, obstipation and no passage of flatus. The patient keeps very quiet, the respirations are rapid, shallow, and of the costal type, the pulse is weak and rapid, and there is diffuse tenderness and constant rigidity. We also find a leucocytosis and a difference of two or more degrees between

the rectal and axillary temperatures. Pain on rectal examination is also found if the peritonitis extends to the pouch of *Douglas*. The picture will be greatly changed in septic or gangrenous peritonitis and will resemble the picture already described under septic peritonitis.

Acute tuberculous peritonitis presents a picture in which the muscular tension is not marked; there is no striking leucocytosis and no positive *Diazo* reaction; the serous exudate is apparently sterile, but may show bacteria on animal inoculation. The fluid may contain more polynuclears than lymphocytes. The level of the exudate changes promptly with change of position. There may be no other apparent tuberculous focus, as acute tuberculous peritonitis may be the only manifest sign of the infection, for example, when it follows tuberculosis of the intestine.

We shall now consider the various types of purulent peritonitis according to the causative bacteria. The usual bacteria causing peritonitis are the common pus organisms, colon bacilli, typhoid and paratyphoid, gonococcus, pneumococcus, *Friedlænder* bacillus, and other similar encapsulated bacilli. Mixed infections are also rather common. The early clinical signs of peritonitis, the so-called peritonism, is due to the general hyperemia and to a serous exudate of the peritoneum, even before there is any visible gross affection of the tissue. This exudate need

not always be sterile, although we consider this type of peritonitis as due to a chemical toxin. Such cases may present meteorism, pains, and tenderness, sometimes even dullness in the dependent portions of the abdomen. In contradistinction to a genuine peritonitis, we find that the general condition of the patient is good; the pulse corresponds to the temperature and will hardly exceed 100 per minute. The muscular tension is not so diffuse as in real peritonitis and will be localized to the affected region, even if there is general tenderness. In the latter case, the tenderness will be most intense over the site of the lesion. The respiratory movement will be absent or lessened at the site of the trouble, and the abdominal reflexes may be missing at this region. The liver dullness is not diminished, a finding which occurs in true peritonitis. The symptoms tend to concentrate towards the diseased area as the course progresses. This picture is seen especially where a perforation has occurred in a previously walled-off space, as in ulceration or carcinoma of the intestine. When the peritonism is caused by disease of the gallbladder or female genitalia, the signs of these conditions will appear in combination with those of the peritoneal irritation. Peritonism may also occur in *Addison's* disease and in acute infection of the intestines, such as anthrax, paratyphoid, and, occasionally, cholera.

The pneumococcic peritonitis has the peculiarity that the diffuse pain and tenderness become centralized soon after their onset, chiefly over the ileocecal region. This affection is found especially in young girls, less often in adults. The underlying pathology is usually a localized, exudative, purulent peritonitis, most commonly caused by perforation of the appendix, periappendicitis, pericholecystitis or pelvic peritonitis following disease of the female genitalia.

An early and important symptom in pneumococcic peritonitis is diarrhea. This accompanies the other peritonitic symptoms, such as severe pain, vomiting, and fever. The process tends to localize because the fibrino-purulent exudate, which forms in the early stages, tends to wall off the process. The most common localization is about the umbilicus and the lower right part of the abdomen. This localization is often the cause for confusion with appendicitis. The general condition of the patient is usually good, and the course is comparatively benign. There is a polynuclear leucocytosis, herpes, and a rich fibrin content in the blood.

A condition which may cause confusion with general peritonitis is periarteritis nodosa, or, more specifically, mesoperiarteritis nodosa. This disease begins with the general symptoms of infection, such as fever, increased pulse, anemia, marked pains in the extremities, and profuse

sweating. Nephritic symptoms and peritonism often appear after a few days. The final diagnosis will be made upon palpation of the small aneurismic bulgings in the surface arteries of the skin and muscles of the intercostal spaces with, perhaps, an eosinophilia. The *Wassermann* reaction may be of value if the disease is of syphilitic origin.

There are extraperitoneal causes of the type of abdominal pain under discussion. The cause may be a rupture of a hydronephrotic sac, involvement of the cœliac plexus, and acute or purulent inflammation of the retroperitoneal tissue. The cause of the retroperitoneal inflammation may be a recent one or one which has existed for a long time. It may even be due to an inflammation of the inguinal glands or to acute bilateral renal infarcts resulting from an endocarditis.

Another cause is acute pyelitis, especially in pregnant women. This begins with chills and high fever, but the pain is most marked in the lumbar region, with tenderness over this place, hyperesthesia of the skin, tenderness of the upper part of the psoas muscle, intermittent fever, and characteristic urinary and cystoscopic findings.

A similar picture may be produced by inflammation, either simple or purulent, of the perirenal tissues. The patient will complain of pain

in the lumbar region, especially below the twelfth rib. There will also be local hyperesthesia, rigidity of the lumbar muscles, and local tenderness on deep percussion. We often find a scoliosis of the lumbar spine. The urine is not cloudy, but contains bacteria. These symptoms are nearly always accompanied by remittent or intermittent fever, and early chills.

Sclerosis of the mesenteric arteries or veins and chronic phlebitis cause severe colicky pains which may also be boring in character. These may appear at intervals of months or days of apparent good health. Sclerosis or phlebitis of the veins can be diagnosed only if there is thrombosis of the portal or intestinal veins. The picture of sclerosis of the arteries will differ according to the distribution of the process, that is, according as to whether it is a local sclerosis of the superior or inferior mesenteric arteries or a general diffuse sclerosis.

There is a group of symptoms in the local form named by me *Dyspragia Intermittens Angiosclerotica Intestinalis* which is characterized by local *"dead"* meteorism, a condition in which there is local pain and meteorism but no visible or audible peristalsis over the affected area.

The patients with diffuse sclerosis suffer from attacks or diffuse abdominal pains, which rapidly increase in severity and last for a few minutes to several hours. The abdomen is tense and

distended, the diaphragm is pushed up high in the thorax, the pulse is accelerated, and the patient complains of oppression, palpitation, and a sticking sensation over the precordium. It is also very important to find that there is no peristalsis in the distended abdomen. The patient states that the pain continues as long as there is absolute quiet in the abdomen, and that the pain begins to disappear when he feels gurgling in the intestines. This symptom is not absolutely pathognomonic, as it also occurs in reflex paresis of the intestine resulting from any remote painful source, as kidney stone, etc. The history is variable; sometimes the patients state that the cause is food which produced flatulence; others blame bodily motion or mental excitement.

In my experience, the majority of cases feel the pain after walking; another group of patients feel it when they are in the horizontal position, especially at night. The latter group must get out of bed with the feeling that they are going to have a bowel movement, but none comes. When the bowels do move, the patients feel much easier. The feces contain occult or a small quantity of manifest blood. Sometimes there is strangury and, occasionally, difficulty in urination. The patient may also lose weight, especially if his sleep is much disturbed by the attacks. Further points are the age of the patient, abuse of tobacco, and evidence of arterio-

sclerosis elsewhere. Finally, we may make use of the therapeutic test by employing theobromine and noting that the attacks disappear for months and leave only a tendency to attacks of meteorism and flatulence.

I may add that aneurism or sclerosis of the abdominal aorta may cause the same symptoms as those resulting from involvement of the mesenteric vessels. Aneurism will also produce pains in the back of the abdomen with radiation to the hypogastrium or scrotum. Simple sclerosis of the abdominal aorta is often characterized by a girdle pain and is accompanied by weakness in the legs. Both the pains and weakness disappear if the patient remains at absolute rest. The diagnosis will be more easily made if we find the signs of thickening of the aorta, such as a convex or serpentine course of this vessel, with the convexity to the left, the presence of a murmur on slight pressure over the aorta, and a systolic murmur when no pressure is made in this place. The pains in general sclerosis of the abdominal vessels may also be explained by the fact that the intestinal wall may undergo a sclerosis or fibrosis as a result of the change in the blood vessel walls. This change in the walls leads to a local paresis of the bowel. The segment immediately above this part becomes hypertrophied and contracts very strongly in the attempt to overcome this paretic obstruction. This abnormally strong

contraction may be the immediate cause of the pains. Sclerosis of the intestinal veins produces pains which are due to the resulting thrombosis.

We sometimes find boring or colicky pains in *Banti's* disease. The special symptoms of this disease are splenic enlargement, anemia, leucopenia, enlargement of the liver, ascites and icterus. Subsequently there is a shrinkage of the liver, likewise swelling of the lymph glands and hemorrhagic diathesis. The sequence of the appearance of the symptoms, as enumerated, is of importance.

Polycythemia also leads to attacks of pain in the epigastrium. These pains may be diffuse or localized, and they may be colicky or of an indefinite nature. The diagnosis will be difficult because polycythemia is often associated with arteriosclerosis and increased blood pressure, both of which may, of themselves, lead to the symptoms under discussion.

Chronic disease of the pancreas may also cause this type of abdominal pain.

Occasionally, the pain in duodenal ulcer, which is typically localized near the gallbladder region, may spread out around the navel and be present in the entire lower abdomen. The differentiation from the pain of arteriosclerosis or nicotinism will be made on the nocturnal appearance of the pain, the lessening of the pain on intake of food, the presence of occult malena, hypermotility,

hyperacidity and on the characteristic X-ray findings. This type of diffuse pain may be due to involvement of the cœliac plexus. The possibility of such a cause for the pain was demonstrated to me at an autopsy of a case of carcinoma of the stomach in which the cœlic plexus was also involved.

Furthermore, all cases of acute intestinal obstruction without signs of acute strangulation belong to this group. We must repeat that the location of the pain and tenderness does not always correspond to the site of the obstruction. From a diagnostic point of view, we must consider two groups of cases. Cases of the first group are those with bowel disturbances lasting for some time. This is the larger group and comprises the cases with chronic obstipation, perhaps alternating with diarrhea, rarely only chronic diarrhea. Occasionally the history may suggest obstruction, the patient may describe movements seen or felt in the abdomen or a sensation as if something suddenly stopped in this region. These symptoms may suddenly become more severe, and the picture may then resemble acute obstruction. The reason for the sudden obstruction may be a dietetic error, a large residue of undigested food, or rapid eating of large morsels. The stagnating food may cause a rapidly developing inflammation of the mucosa, and this swelling may become severe enough to cause a stenosis.

Another cause is kinking of a loop of bowel proximal to the stenosis. The same result may also be caused by flatulence, trauma, or diarrhea in which the peristalsis is increased.

The second group has, as a rule, no premonitory symptoms of the causative factor. The obstruction may be caused by gallstones, less often by other foreign bodies, and very rarely by fecoliths. We must remember the possibility of tumors, scars, or peritoneal adhesions both in this and in the first group. The diagnosis of gallstone ileus will be comparatively easy where there is a history of previous gallstone disease, but, as a rule, the stones pass into the duodenum via a perforation and often produce no symptoms. The peculiarity of gallstone ileus lies in the low-grade meteorism in spite of the presence of complete obstruction and severe symptoms. Flatus and even feces may be passed even in the presence of fecal vomiting. If the stone is jammed high up in the duodenum, we find biliary vomiting, a characteristic sign of duodenal obstruction. We may find evidences of obstruction lower down in the bowel as the stone wanders outwards. This wandering is characterized by pains, first in the pyloric region when the stone passes into the duodenum, later by pains in the umbilical region, and finally at the site of the cecum if the stone remains in this region for a long time. The change in location of the

stone may be followed by palpation and rectal or vaginal examination. The stone does not always wander as just described but may produce a complete obstruction anywhere in the intestinal tract.

We must also include cases of intussusception which are unaccompanied by signs of strangulation. I wish to point out in this instance that fecal vomiting may be absent and that the obstruction may not be complete. On the contrary, a very valuable sign is diarrhea with bloody or blood mucus stools about ten to twenty times a day. Palpation of the intussusception tumor will be a decisive finding.

The picture of intussusception, especially when in the ileocecal region, may be imitated by purpura intestinalis with bleeding into the cecum or ileum and very rarely into the appendix. The bowel becomes paretic and may produce symptoms resembling ileus. The diagnostic features are drawing in of the abdomen, bleeding from various places, and joint symptoms. The picture of peritonitis may be closely simulated if there is bleeding in the peritoneal cavity or hemorrhagic ascites.

Both intestinal obstruction and peritonitis may begin with pain and ileus. Intestinal obstruction, however, produces no tenderness or rigidity of the abdomen and no initial increase in the temperature. The breathing is abdominal, and there

is no great increase of the pain on deep inspiration. Peristalsis may be visible or heard, and the increased contractions may even produce metallic sounds. Comparison of the anal and axillary temperatures as already described may be of value.

In rare instances, localized purulent peritonitis may produce a local muscular rigidity, absence of the abdominal reflexes on the affected side, hyperesthesia of the skin in this region, and a slight dullness or sensation of resistance over the disease area. The symptomatic ileus, which develops rapidly, retrogresses, and the intestinal contents may be pushed from one distended loop into another with a gurgling sound. The passage of flatus speaks rather for a circumscribed peritonitis, as this phenomenon is not present in obstruction, except in intussusception or when due to gallstone impaction within the bowel.

Ileus due to a foreign body within the bowel may occasionally be accompanied by fever and thus make its differentiation from a circumscribed peritonitis very difficult.

Acute, diffuse, colicky, abdominal pain may be caused by incomplete stenosis as well as by complete obstruction. The symptoms depend on the localization of the obstruction. A patient with stenosis of the bowel may show local stiffening or peristalsis over the small intestine, and he may hear squirting sounds in this region. The

pain is chiefly around the navel and radiates to the back. Colic may be absent for a long time in chronic stenosis of the colon. This colic, when it appears, will be located along the colon, especially in its transverse segment, and will travel from right to left. Stenosis of the lower segments of the bowel may produce pain in the lower parts of the abdomen. In this connection it is interesting to remember that patients with stenosis of the colon may complain of pain in the stomach region.

Acute, more or less diffuse and colicky pain may be produced by acute, subacute, and even chronic peritonitis, usually tuberculous in nature. Such pains are not present in the early stages of carcinomatous peritonitis, and this point may be considered in the differential diagnosis. Symptoms of peritonitis or ileus may accompany these pains, especially in the cases of so-called peritonitis tuberculosa enteroparalytica. It must also be remembered that a fluid exudate in the peritoneal cavity may not be present, and in such cases we may depend on the presence of fever and rapid emaciation. These diffuse pains may be present during the course of tuberculous peritonitis as well as at the onset, but in the former instance the pain will be due to complications, such as stercoral abscess of the intestinal wall, ulcer, perforation of such a tuberculous ulcer, or adhesions between intestinal loops.

Such diffuse colicky pains may also be due to an after-effect of an acute fibrino-purulent peritonitis, not tuberculous in nature. This type of cases is associated with meteorism, diarrhea, and vomiting, especially after food which leaves a large residue, or after heavy meals. The diagnosis will be based on this history and on the presence of tenderness. The tenderness may be diffuse or localized to several areas if there were several such foci at the onset of the disease. Rigidity, dullness on percussion, and a vague tumor may also be found in these cases. Leucocytosis, occasional fever in the evening, and a gradual recrudescence of the symptoms will further characterize this disease.

A similar subacute or even chronic picture may occur in typhoid. This peritoneal involvement need not be due to a perforation but may be caused by a migration of the bacteria into the peritoneal cavity from a slowly progressive necrosis of some abdominal organ.

Furthermore, we must mention the simple intestinal colics which are due to irritation of the intestines by various causes, or which arise by a reflex route. We must also consider inflammatory, ulcerative, vascular, or functional nervous disease of the bowel. The diffuse pains and tenderness are produced by peritoneal irritation, and the localization depends on the site of the original trouble.

We must not forget that hysteria may cause such pains either as a purely hysterical attack or as a provocation by enteritis, etc. Rapid change of symptoms, superficial tenderness with absence of tenderness on deep pressure, ready suggestibility, evidence of other hysterical signs and absence of genuine peritonitic findings, especially of shrinkage of the liver dullness, may all aid in the diagnosis of hysteria. The abdominal reflexes are absent, and there will be no sign of peritoneal irritability such as one finds in peritonitis. The patient shows evidences of pain in genuine peritonitis if the hand, which was pressing deeply on the abdomen, is suddenly removed. This is a sign of peritoneal irritability found in cases of peritonitis, but not in hysteria.

In the differentiation of simple, localized, intestinal colic from intestinal obstruction, we cannot lay much stress on the etiological factor unless it be lead poisoning. Any irritation of the bowel, either reflex or actual, may be followed by simple intestinal colic. They may produce pains in an ulcerative condition of the bowel, or they may be the first sign of an actual obstruction. I wish to emphasize the fact that a chronic stenosis may remain dormant for a long time and then suddenly give rise to symptoms of an acute stenosis. Acute and chronic intestinal catarrh may also cause colic, and we must remember that

this catarrh may also be the result of a chronic stenosis.

The striking difference between a simple colic and one due to stenosis is the intensity of the pain and the general effect on the body. Unbearable pains, prostration, increased pulse, and extremities speak for stenosis if we are not dealing with a hypersensitive patient. Vomiting and collapse may, however, be caused by severe catharsis. The shape of the feces and the palpation of the fecal masses in the abdomen are of no very great value and often lead to error. A copious stool either spontaneously or after catharsis is not a positive proof against stenosis.

Splashing and gurgling sounds are a valuable aid in excluding such extraintestinal conditions as gallstones, renal calculus, or peritonitis. Ulceration of the bowel may produce attacks similar to those caused by the above-named extraintestinal conditions, but will be differentiated by the splashing sounds, migrating nature of the colic, and by the comparatively short duration of the intense period of the attacks. The attack may end with the passage of a fluid bowel movement of a distinctly bad odor, or the pains may be increased as a result of the increased peristalsis. Occult blood is also very often found in ulceration of the bowel. There may be spirillæ or the specific organisms of dysentery in the feces.

Lead colic distinguishes itself by the fact that the pain begins in the region of the navel and later becomes diffuse. Furthermore, there is constipation before, during, and after the attack, the abdomen is drawn in, and the pain persists for several hours and may be increased by pressure. Vomiting is frequent and severe, the pulse is slow and of high tension, the second aortic tone is accentuated, and the history may point to lead as the cause of the trouble.

Another type of colic is the so-called appendicular colic which is caused by a cramp-like contraction of the appendix musculature in an attempt to force out some pathological contest, such as a fecal stone, foreign body, or plug of mucus. It may also occur in simple catarrhal appendicitis, when adhesions or kinking are present. The pain is diffuse in many cases, meteorism is present all over the abdomen, the abdominal walls are tense and tender, and there are fever and vomiting. Peritoneal symptoms may be present in the cases of catarrhal appendicitis. The attacks subside in six to eight hours, the tenderness and meteorism become localized to the ileocecal region, and the swollen appendix may even be palpable. The patient may, however, complain of pain in the ileocecal region upon stooping or walking. The recognition of this type of colic will be based chiefly on palpation and the findings on rectal and vaginal examina-

tion. Such a colic may also occur in acute appendicitis which results from a co-existing typhiloappendicitis. The cecum and ascending colon will also be tender in these cases. Appendicitis in children may produce only the above-described colic without development of any other symptoms of appendicitis. The possibility of appendical disease must be considered when we find such a colic suddenly appearing during or immediately after bodily motion or straining at stool.

When a patient complains of recurring, diffuse, or vague colicky pains with constipation or constipation alternating with diarrhea, we will have to consider multiple peritoneal adhesions as a possible cause. There may be complete absence of objective findings in these cases and an assumptive diagnosis may be made on the persistence of the symptoms in spite of all treatment. The patients fear to eat because they believe that the food will cause pain. As a rule, the diagnosis will be made of chronic intestinal catarrh or even of neurasthenia. The history of a previous disease capable of producing adhesions, the statement by the patient that the pains appear rather regularly on frequent stooping, walking, or running over an uneven surface, and the X-ray examination will help in the diagnosis.

We must not forget that there are genuine intestinal colics caused by spasm of the bowel musculature, either in its entire length or only

of certain segments. This may occur either in the large or small intestine. The underlying cause may be a central or local affection of the nervous system, such as tabes, affections of the vagus, chronic nicotinism, or a purely functional disturbance. Tabetic crisis occasionally follows periods of indigestion, but the typical attack comes out of a clear sky without previous warning. Such an attack begins suddenly, may last one or more days, and ends quite abruptly. The gastric crises due to other diseases of the spinal cord resemble that produced by tabes. The same is true of crises produced by sudden irritation of the posterior roots, as in anterior poliomyelitis, acute myelitis, acute hematomyelia, and embolus or thrombosis of the vessels of the spinal cord.

Similar crises may also be caused by diseases of the abdominal aorta, *Graves'* disease, affections of the pancreas, and the neurosis which is associated with an eosinophilia in the blood and feces, and which may show a family eosinophilic diathesis. These diatheses may be associated with bronchial asthma, eczematous dermatosis, intermittent swelling of the joints, and angioneurosis.

The diagnosis of such a nervous enterospasm will be difficult, as the pains may become diffuse, or the entire picture may resemble incomplete intestinal stenosis with constipation. Stiffening and meteorism are, however, usually absent.

The feces in enterospasm may be ribbon-like, divided in small particles, and covered with mucus, while the bowels may move only between long intervals of apparent constipation. The spastic condition of the bowel may be recognized by the effect of papaverine as seen under the X-ray.

Mucous colitis may cause diffuse colic, and the nervous patient may show symptoms which closely resemble collapse. This form of colitis may be only an accompanying symptom in lead poisoning or sclerosis of the intestinal vessels. The intimate relation between mucous colitis and bronchial asthma is well known (*Neusser, Strümpell*). I remember a patient in whom the typical attacks of bronchial asthma alternated with enterospastic colics either with or without mucous colitis and eosinophilia in the feces. I consider this enterospasm an expression of abdominal vagotonia.

Such diffuse, abdominal pains may also be the expression of an epileptic aura.

Extraabdominal conditions, such as pleurisy, pneumonia, empyema, pneumothorax, and especially diaphragmatic pleurisy, may cause diffuse abdominal pain with tension of the abdominal walls, nausea, vomiting, and constipation. These may be recognized in the early stage by the discrepancy between the respiratory and pulse rates and by the fact that the tenderness

of the abdominal walls is less marked on deep pressure than it is on superficial palpation. A rapidly developing meningitis may also cause the above-described abdominal picture with diarrhea. The abdominal pains in meningitis may be caused by irritation of the spinal roots either by the toxin or by the exudate. Acute affections of the muscles of the abdominal walls only rarely produce pseudoperitonitic symptoms.

Another supradiaphragmatic condition which may be a cause of pseudohepatic colic is subdiaphragmatic angina pectoris, especially in view of the fact that, according to *Neusser,* a mild degree of icterus may also be present. Important in the recognition of this condition is the marked feeling of anxiety, something which occurs in cholelithiasis only exceptionally. Another diagnostic point is the difference between the subjective symptoms and the absence of the usual findings as seen in cholelithiasis. Furthermore, the striking pallor and the effect of vasodilator medication will distinguish the disease.

Tetany may be associated with diffuse colic either of the stomach or intestine. The history, the occurrence of the attacks chiefly in the spring time, *Trousseau's* phenomenon, and the electrical irritability of the motor nerves will help in the diagnosis.

Another type of abdominal colic has been recently described which is due to apoplexy of the

adrenals. The clinical picture is not yet completely described but is, in short, intense colic, which is repeated every few hours, slow, hard pulse, occasional vomiting, a sense of impending death, tension of the abdominal walls, no fever and no visible stiffening or peristalsis. An anemic, contracted loop of bowel has been seen on laparotomy. Other cases show periodic apathy, sweating, and a slow, irregular pulse. The painful attacks are so intense, that the patients may cry out as in meningitis. Thirst, anorexia, and vomiting may also be present.

Acute adrenal insufficiency may also cause diffuse abdominal pains which are not always colicky in nature. This may occur during the course of acute infections, narcosis or labor. It may also result from chronic epinephritis, in which cases the patients may complain of intermittent, severe abdominal pains for a period of years before a severe attack occurs. This sudden adrenal insufficiency may cause symptoms which resemble acute or septic peritonitis. The diagnosis may be made on the striking adynamia, subnormal temperature, progressive fall of blood pressure, vomiting, diarrhea, cerebral symptoms (delirium, coma and meningitis-like symptoms), and acute insufficiency of the circulation with cyanosis. The abdomen will be soft and sunken, and there is no rigidity. Rectal and vaginal examination are negative.

## Mild, Diffuse, Colicky Pains

The first consideration must be given to the simple intestinal colics. These last but a few minutes, disappear or at least improve after passage of feces or flatus, application of heat to the abdomen, massage, pressure, or assumption of the crouched position. Such colics may be due to intestinal parasites and are usually associated with headache, nausea, dyspepsia, and excessive hunger. Such mild colics may also be caused by infectious diseases in which the intestines are particularly involved, as in paratyphoid, dysentery, cholera, anthrax, typhoid, and Malta fever.

Such mild attacks of colic may also be caused by mild appendical disease. Mild appendicitis may not produce any real pain but only chronic dyspeptic complaints, some meteorism, irregular bowel movements, and a vague, colic-like feeling, brought on by indiscretions in diet. Of importance are local tenderness over *McBurney's* point, local hyperesthesia of the skin, and determination by the X-ray that the point of tenderness corresponds to the appendix. Peritoneal adhesions cause pains on stooping and during defecation or urination. Vomiting, nausea, eructations, and sudden stoppage of feces and flatus may also be seen in some cases.

### Mild, Diffuse, Abdominal Pain not Colicky in Nature

We must not forget that, occasionally, acute peritonitis or chronic tuberculous peritonitis, and especially pneumococcic peritonitis may produce this type of pain and not that which is usually present in these cases. The latter form of peritonitis will often produce herpes and diminished chlorides in the urine.

Acute miliary tuberculosis of the peritoneum must be considered if pains and free fluid appear in the abdomen during the course of a case of known miliary tuberculosis. In some rare cases, the abdominal symptoms may be the most conspicuous, and the diagnosis will be strongly supported by finding a hemorrhagic fluid with a predominant lymphocyte count, even though the course is acute. Other foci of tuberculosis may be found in the pleura, pericardium, or synovial membranes of the joints. We must remember that tuberculous peritonitis may begin with painful flatulence.

Diffuse carcinomatous peritonitis rarely produces pain. This condition is differentiated from tuberculous peritonitis by marked edema of the skin of the abdomen and absence of anasarca; the urine is pale, and the peritoneal fluid is hemorrhagic. The finding of tumor masses and fluid in the abdomen at the same time speaks for car-

cinomatous peritonitis, as the fluid in tuberculous peritonitis disappears when the tumor masses develop. Cytological examination of the fluid in these cases is not of any differential value, and the same is true of a positive *Diazo* reaction or fever. Localized peritonitis, such as occurs in periappendicitis or perisigmoiditis as well as in affections of the intestines may all begin with such diffuse pains which later become localized. Pancreatic affections of mild degree or functional nature may also lead to such pains, but, as a rule, these tend to remain localized in the epigastrium.

The muscles of the abdominal walls, especially after prolonged contraction, may also cause such pains. The other muscles will, however, also be affected. The abdominal muscles alone may be affected in tetany in cases of gastric dilatation. Muscular pains may also be caused by prolonged and severe coughing, singultus, dyspnea or prolonged vomiting.

The ordinary rheumatic myalgias are characterized by the fact that the pains are usually diffuse and shift in location. There is no fever, and the pain is increased by muscular movements such as during coughing, sneezing, getting up, or walking. The pains regress or disappear when the patient is quiet, and reappear when he moves about. Sudden pressure increases the pains, while pressure, when gradually applied and increased,

does not make them more severe. The pains are sometimes localized at the tendinous insertions of the muscles. Food or digestion has no effect, while the influence of weather, local heat, and aspirin is well known. Muscular pain may be very severe in the infectious diseases in which there is degeneration of the muscle.

Hemorrhage into the degenerated muscle in typhoid fever may even simulate intestinal perforation, but is distinguished by the fact that the tenderness is greatly increased when the muscle is contracted as in sitting up, while application of pressure during this act does not produce an increase of the pain in intraabdominal disease.

Trichinosis of the muscles may cause such pains as well as nausea, vomiting, and diarrhea. The pains may be due to the presence of trichinæ or to the enteritis. The diagnosis will be made on the presence of tenderness in other muscles, the pseudotyphoid course, sweating, edema of the skin, especially of the eyelids, eosinophilia, the history, and, finally, the histological examination of a piece of excised muscle.

The subcutaneous tissue may also be the seat of such pain. This may be the case where there is a rapid loss or gain in weight. The pain may be in the epigastrium in these cases. Adipositas dolorosa may be another cause and is recognized by finding painful, fat nodules, bluish-red color and increased consistency of the skin, and by the

distribution of the disease on the extensor surfaces of the deltoid, humerus, and legs.

Such pains in the abdomen may also be found in acromegaly and are due to the increase in size of the abdominal organs.

Finally, we must remember that affections of the seventh and eighth intercostal nerves may cause pain in the abdomen. This may be due to a primary neuritis, disease of the spinal cord, or irritation from the pleura. The diagnostic features are the pressure points along the nerves, the sensory disturbances, and the effect of injections as of pyramidon at the site of pain. Superficial touch will be more painful than deep pressure, and the navel will be displaced by the spasm of the muscle.

### Chronic, Diffuse Abdominal Pains

We must keep in mind all the types of chronic peritonitis, such as neoplastic, tuberculous, syphilitic, chronic adhesive, and that resulting from changes in the peritoneum caused by a previous acute peritonitis. All these may remain dormant for a long time and may not produce demonstrable tumors or fluid. This is especially true in the syphilitic and chronic adhesive types. Chronic, diffuse pains may also be produced by localized processes such as periappendicitis or pericholecystitis. Finally, we must remember the neuroses which are especially common during the climacterium.

## Localized Abdominal Pain

Before discussing abdominal pain and its localization, I wish to emphasize a few general important points. The first is that we must keep in mind the possibility of a dystopic organ, that is, an organ not in its normal place. Ileocecal pains, for instance, may be produced by a wandering kidney or spleen, low pylorus, long sigmoid flexure, or long jejunal loops. Again, pains in the gallbladder region may be due to an upward dislocation of the right ovary or even uterus when it is drawn up to this region. The appendix, in particular, merits discussion as an organ capable of assuming any location in the abdomen. It may be located in the gallbladder region when the cecum has not descended to its normal location, it may be on the left side in cases of inverse position of the abdominal organs, or the appendix itself may be in its normal location, but with the tip outside of this area as a result of adhesion. The pains in appendicitis may be located anywhere in the abdomen, and operation may reveal the abnormal location of this part of the bowel. In addition to the usual symptoms in these cases of disloca-

tion, we have a very important finding in the appearance of pain over the normal appendix area when we press over the displaced appendix wherever it may happen to be, while pressure over the ileocecal region may cause pain in the displaced appendix.

The second point is that a tuberculous peritonitis may begin or subsequently localize in any part of the abdomen.

A third point is that pains and other peritonitic symptoms, such as meteorism, rigidity, dullness, and evidences of a localized exudate, which shift from place to place, may be manifestations of a progressive fibrino-purulent peritonitis. Other conditions which may cause such a picture are the spreading of a local peritonitis or a tuberculosis of the intestines leading to tuberculous or purulent peritonitis.

## Epigastralgia or Stomach Cramps

### Colicky Epigastralgia

When a patient complains of colicky pains in the epigastrium, I usually adhere to the following principle: in middle-aged male patients and young girls up to the age of puberty, I first suspect the appendix; in women past the age of puberty, especially during middle age, I suspect liver colic, that is, cholecystitis or cholelithiasis, especially if gynecological disease can be ruled out.

Epigastric pain occurs especially during the first or second day in appendicitis. These pains also occur very early in mild cases of gallstones and may come in attacks over a long period of time in the chronic cases. Appendicular colic must also be considered when the epigastric pains are colicky in nature.

Appendicitis has already been described on pages 72, etc., etc. Briefly stated, it may cause colicky epigastralgia, reflex vomiting, occasionally symptoms of collapse and spontaneous disappearance of the pain in a few hours even without medical aid. The attacks may recur either

without apparent reason or they may follow dietetic errors, brisk motion, chilling of the body, constipation, diarrhea, or migration of parasites into the appendix. The diagnosis will be made on the location of the chief point of tenderness under *McBurney's* point, pressure in the epigastrium will cause pain in the ileocecal region, while pressure over the latter area may provoke pain in the epigastrium. There are hyperesthesia of the skin over the ileocecal region, absence of the abdominal reflexes in the right lower abdomen, *Küstner's* sign, that is, absence of bulging of the ileocecal region during inspiration, and *Blumberg's* sign, which consists of an increase of pain upon suddenly releasing the hand after deep pressure has been applied over the appendix. Occasionally, the tender appendix may be palpable.

Similar objective findings are found in acute appendicitis, that is, endoappendicitis. The tenderness will be limited to the appendix in this condition, while the surrounding parts will not be tender even on deep pressure. The appendix itself may be palpable as a finger-like tumor, which is smooth and which may or may not be movable. Vomiting and fever may be present for a few days. As a rule, we find constipation, while diarrhea is rare and when present usually appearing before the attack. Upon careful questioning, we learn that the pain is continu-

ous, but there may be remissions, and it is often described by the patients as stomach cramps.

The palpable tumor mass in acute periappendicitis may be due to perforation, migration of bacteria through the appendix wall, causing inflammation, and exudate. The mass is smooth, fixed, and cylindrical in shape, and it sometimes fills out the entire lower right quadrant of the abdomen. The mass may also be caused by the edema, feces in the cecum, or adherent omentum or intestinal loops. At times we may feel a vague, tender resistance instead of a definite mass. Of great importance is the sequence in which the symptoms develop. The disease begins with a continuous pain, followed shortly by nausea or vomiting and in a few hours by fever. The pulse rate is increased, and sometimes we observe chills with the onset of fever.

The objective findings are similar to those in appendicular colic plus the finding of the palpable tumor mass and the other findings usually present in appendicitis. The pains may sometimes radiate to the right lower extremity and occasionally to the testicle. Vaginal and rectal examinations are important. These examinations will sometimes show tenderness in the ileocecal region, and the tender tip of the appendix may occasionally be palpated. The navel and linea alba may be drawn to the right, the vena circumflexa ileæ may be dilated, and pain may be pro-

duced by performing the *Kernig* test. Sometimes the patients keep the right thigh in flexion, either to loosen the muscle tension or perhaps as a result of a spasm of the psoas. The patients stoop forward when walking for the same reason. The patient is unable to remain on his left side. Pain may sometimes be produced in the ileocecal region by pressing upward along the descending and transverse colon without touching the ileocecal region. Pain in the appendical region may also be elicited by traction on the right spermatic cord. There may be pain during urination and before or after defecation. Tenderness will be present on percussion of the abdomen.

Such stomach cramps may be observed in chronic as well as in acute cases of appendicitis. This is especially likely to occur in chronic adhesive appendicitis or even where no evident pathology exists except an abnormally long appendix or one with a very short mesenteriolum. The diagnosis will be supported if we can palpate the appendix. In this connection, I wish to adhere to the principle of *Hausmann,* who states that we must palpate the last part of the contracted ileum at the same time that we feel the appendix, in order not to mistake the former for the latter.

Adhesions about the appendix need not be due to diseases of this organ but may be secondary to disease of the female genitalia, cholecystitis

or pericholecystitis, perigastritis, periduodenitis, pericystitis, trauma, or polyserositis chronica.

There are diseases of the ileocecal region other than appendicitis which may cause epigastric pains with radiation of the shoulder so that the picture may resemble that of cholecystitis. Such conditions are the various stenoses of the intestine or cecum, but these cases will also show many gurgling sounds which arise from the intestine. Other diseases are cecum mobile and tuberculosis of the ileocecal region. The latter may closely resemble gastric ulcer if the pains appear about five hours after meals and radiate behind both costal arches.

There are two conditions causing epigastric pains in which the diagnosis can hardly be made. These are volvulus of the appendix and torsion of the appendicæ epiploicæ.

In a previous paragraph, I have already stated that severe abdominal pain in women must awaken the suspicion of a possible gallbladder affection. The pains may vary greatly in severity and duration. We must also remember that such pains may be due to actual reflex pylorospasm or gastrospasm conditions which are often associated with disease of the gallbladder. The pyloric spasm may occasionally be palpated, and the gastrospasm and pylorospasm may be detected by the X-rays.

Gallbladder disease may be suspected when

the pains occur at the same time after meals, and when the most frequent period is during the night.

Such nocturnal pains are almost characteristic for gallbladder trouble, but cannot be considered as pathognomonic, as we know that pain at this time may also be caused by ulcer of the stomach or duodenum as well as in chronic or recurrent appendicitis. More important for the diagnosis of gallbladder disease is the fact that the pain begins very suddenly, is often accompanied by a chill, and quickly reaches its maximum severity. The pain radiates to the right costal arch and to the right side of the chest, behind the sternum, but especially to the region of the posterior part of the liver and right shoulder-blade. The epigastrium may bulge forward, and it is characteristic that the vomiting, if it occurs at all, does not entirely relieve the pain. The pain tends to disappear rather abruptly, even if its onset was gradual. The severity of the pain prevents deep breathing, the skin over the liver is hyperesthetic, and the same is true over the region of the gallbladder and posteriorly between the tenth and twelfth ribs on the right side. The patient cannot remain on his left side, and he sometimes complains of dizziness during the attack. Reflex rigidity of the right upper rectus is very important, as are tenderness on pressure or percussion in the region

of the incisura hepatica, especially if we palpate upwards rather deeply during inspiration. Tenderness on pressure or percussion may sometimes be found in the midline or even to the left of it, and may thus resemble gastric disease. Pressure over the gallbladder may sometimes cause pain in the epigastrium. When the pains are far to the left of the usual location, we may be dealing with stenosis of the common duct.

Enlargement of the liver and a perihepatic rub may sometimes be found. Mild cases may not show any tenderness, enlargement of the gallbladder or even fever. Chilly sensations or chills may, however, be present. Icterus is absent in the majority of cases of gallbladder disease, but urobilin and urobilinogen are usually present in the urine. Icterus occurs only when there is a stone or inflammation of the mucosa of the common duct. The inflammation may extend from the hepatitis or from the cholecystitis to the common duct.

Not uncommonly we find that gallbladder disease and appendiceal affection exist together at the same time. This may be due to a spread from one to the other by hematogenous or lymphatic routes or by peritoneal adhesions extending from one to the other. If the adhesions from cholecystitis involve the duodenum or pylorus, then we may observe a combination of symptoms arising from the causative trouble

plus the signs of stenosis of the stomach outlet. We must also consider the possibility of a simultaneous, hematogenous infection of the gallbladder and appendix from some other source.

The diagnosis of adhesions will be based on the colicky nature of the pains without enlargement of the gallbladder, absence of a perihepatic rub, a history of previous attacks of colic, appendicitis, disease of the female genitalia, or of operation on the gallbladder with reappearance of the pains.

Disease of the stomach, anatomic, secretory, or neurotic, may be considered after disease of the gallbladder and appendix have been excluded. A genuine nervous gastralgia is one of the greatest of rarities, and I avoid this diagnosis as much as possible.

We may consider neurotic gastralgia if the pain is neither increased nor decreased by local pressure or when it is lessened by galvanization. There may be marked tenderness upon light pressure over the cœliac plexus. The pains in these cases are very capricious and easily influenced by psychical states, food may not at all alter the pains, and sometimes the patients state that they can now eat certain foods which they could not previously bear. The patients do not experience difficulties with indigestible foods and may complain after eating a very light meal. The fact that the pain

appears almost immediately after meals is suggestive, but this occasionally occurs in gastric ulcer. Finally, we sometimes observe that the patients get an abnormal sense of thirst and hunger immediately after an attack. Polyuria and frequent urination may occur in anatomic as well as in functional disease of the stomach or even in disease of other organs.

More frequent than the genuine primary gastralgias are the secondary gastralgias resulting from disturbances in the female genitalia, as in cases of menstrual gastralgias, even if the female genitalia are anatomically normal. Anatomical lesions causing gastralgia are those occurring in the ovaries, uterus, or tubes. Both the gastralgia and the disturbance in the female genitalia may be caused by a disease of the nervous system or by abnormal position of the female genital organs. Sexual neurosis in men may also be responsible for pains in the epigastrium. Other causes of secondary epigastralgia are disease of any of the abdominal organs, the presence of intestinal parasites, disease of the central nervous system (tabes), intoxications, as nicotinism, and infections, as malaria.

We shall now discuss the organic affections of the stomach. A simple acute indigestion may lead to such a stomach cramp when caused by food that is too hot or mechanically too ir-

ritating to the stomach, very spicy or gas-producing, by coffee, or by too rapid eating. Such pains will last a comparatively short time and are relieved by deep pressure, crouching posture, or local application of warmth to the abdomen. We must remember that such indigestion cramps will appear much more readily in a stomach which is already diseased, as by gastric ulcer, etc.

The gastric ulcer is one of the most frequent causes of stomach cramp and is due to pylorospasm, gastrospasm, or, if the ulcer is located high up, to cardiospasm. Such a cramp following acute indigestion, trauma, or "cold" may be the first sign of gastric ulcer. It may occur for weeks or months, while the patient is free from any discomfort during the intervals. By and by the intervals become shorter, and the attacks sometimes occur at night. We may explain this nocturnal appearance by remembering that the food residue which remains in the stomach overnight sets up an irritation which is followed by a pylorospasm, or, perhaps, direct irritation of the ulcer area. We must also consider genuine "wound pains" caused by irritation of the sensory nerves at the base of the ulcer. This pain is sharply localized, and the tenderness on pressure or percussion is sharply circumscribed. The localization to the left of the midline is not alone associated with ulcer,

as it may also occur in carcinoma or neurosis. The tenderness is increased by deep pressure, the skin of the epigastrium is hyperesthetic, the tender point of *Boas* is present in the back, and the X-ray will show a "*Nische*" at the site of the ulcer with a spastic indrawing of the opposite side. In addition, there are two important findings, the occult bleeding in the stool and the hyperacidity. The history will complete the picture when the patient states that the severity of the pain depends on the nature and time of meals, and that the pain often disappears after a milk diet. The pain radiates especially to the left side of the trunk, going backwards like a bridge from the epigastrium to the spine or even to the shoulder-blades. The pains may be so severe that the patients are afraid to eat. There are also eructations and vomiting of acid contents.

We must remember that there are cases in which the history resembles that of a nervous affection. These patients digest heavy food and experience pains, especially after psychical excitement.

Typical cases will cause no difficulty in diagnosis, but we must not overlook the fact that there are ulcer cases, proved at operation, which have shown subacidity or even anacidity. There are also cases in which there is little or no pain and in which the first sign of serious trouble is

hematemesis or perforation. There are cases in which the pain does not depend on the food intake, but occurs on bodily motion or adoption of a certain position. The pain in the latter group may be explained by a pulling on the adhesions or by the fact that the acid stomach contents are in contact with the ulcer surface only when the patient is in a certain position.

Similar pains may, of course, be caused by ulcers of various types, such as tuberculous or syphilitic lesions.

Patients with ulcus callosum penetrans are often anemic and cachectic, like those suffering from carcinoma, and this may cause confusion when a tumor mass is palpable on the left side. The chronic nature and the periodicity are characteristic, but the attacks themselves may vary in intensity. The pain does not often radiate to the back and hyperacidity need not be present, but the condition is differentiated from carcinoma by the X-ray, bacteriological, and chemical examination of the stomach contents.

The symptomatology of the chronic gastric erosion closely resembles that of the peptic ulcer. We know that such hemorrhagic erosions follow such affections as chronic gastric catarrh and affections of the blood vessels of the stomach (amyloidosis, arteriosclerosis, luetic endarteritis, thrombosis, and emboli). We also find them in the acute infections and nephritis.

We must, perhaps, consider these erosions as an early stage of ulcer. Above all, the diagnosis is established by the fact that the acute malena and sensation of weakness disappear after a milk diet of a few days to a week. I lay great stress on the finding of needle-point, blood-tinged particles in the stomach contents, which appear like collections of cells on microscopical examination, assuming the shape of the gastric glands. These erosions are a part of the affection known as gastritis exfoliativa. Macroscopic hematemesis is absent, and we sometimes find a subacidity or absence of acid. The pain may be very severe and appear early after meals (one-half hour) and disappear in about two hours, depending on the nature of the food. The pain is not cramp-like but gnawing in character and is diffuse in distribution. It does not radiate, and there is no hyperesthesia of the skin.

Just as gastric ulcer leads to a pylorospasm which is due to a hyperacidity, so may hyperacidity alone cause pyloric spasm with a sensation of heaviness, pains, and burning in the epigastrium after meals. We will find that certain foods, especially starchy foods, will more readily cause these epigastric pains. Fats, albumin, alkalies, or dilute foods like milk or beer will diminish the pains. There are also heartburn, acid eructations, and occasionally vomiting of

very acid contents, with relief of the symptoms. Nocturnal pains appear only if the patients eat abnormally rich or indigestible food in the evening. Hyperacidity rarely occurs as a functional, secretory disturbance of idiopathic origin. It is more often a symptomatic finding resulting from an anatomical, gastric, or extragastric disease. The diagnosis is made on the finding of hyperacid stomach contents and an alkaline urine. The objective findings may be very mild or diffuse, with indistinct tenderness in the epigastrium, especially in the pyloric region.

Another condition which may cause identical symptoms is hypersecretion, of which we recognize three types—the continuous, the intermittent, and the digestive. We will suspect this condition when we obtain a strikingly large amount of fluid on aspiration of the stomach contents, with food rests which are well digested and HCL values of variable degrees. The safest method to determine this condition is to give a dry test meal consisting of five very small biscuits and to aspirate in from one-half to three-quarters of an hour. In hypersecretion, the contents obtained after this dry meal will contain an abnormal amount of acid fluid.

A digestic hypersecretion may be a reflex neurosis in cases of nervous dyspepsia, especially when combined with enteroptosis or atony of the gastrointestinal tract. It is also a common find-

ing in gastric ulcer, acid gastritis, cholelithiasis, appendicitis, hernia of the linea alba, and cases of chronic nicotinism.

The intermittent type of hypersecretion will have to be considered when we obtain a history of repeated attacks of sudden, cramp-like pains either during the night or more commonly in the morning, followed by vomiting of bile-stained residue of food which was eaten during the previous evening, and, later, with vomiting of strikingly large amounts of fluid. Such an attack may last several hours or days. We will find a large quantity of acid, sometimes hyperacid fluid contents, on aspiration during the attack, either during a test meal or from an empty stomach. Such an intermittent hypersecretion may be purely functional and may be caused by psychical emotions, or chronic nicotinism. It may occur in the gastric crises of tabes and cause the pain instead of the usual nervous factor. Furthermore, we know that it occurs in migraine, cerebral affection, and *Basedow's* disease.

More common than the intermittent type is the continuous hypersecretion. Only a few authors consider it as idiopathic in origin. I am in accord with those who consider it as a symptomatic disease, resulting from ulcer, chronic nicotinism, or benign pyloric stenosis; less often resulting from extragastric conditions, such as

duodenal ulcer, periduodenitis, chronic obstipation, intestinal parasites, especially tænia, and tabetic crises; found occasionally in cases of chronic icterus following biliary cirrhosis or obstruction of the bile ducts. It may also be due to simple chronic gastritis with pylorospasm. Continuous hypersecretion is very rarely found in carcinoma or sarcoma of the stomach.

The history of this symptom is very characteristic. The patients not only complain of pain after meals, but also of a burning or feeling of pressure even when the stomach is empty, especially at night or early in the morning. The feeling is relieved by fat or albumin and is followed by vomiting of a large amount of fluid. The contents may be distinctly three-layered, the upper foamy layer, containing gas bubbles, the middle fluid layer, which is the one that is so copious, and the sediment. The hypersecretion itself is continuous, but the subjective symptoms may be intermittent, and this is shown by the fact that we can obtain hypersecretion contents from the stomach during the apparently normal intervals. Hypersecretion may also be recognized by X-ray upon seeing a large quantity of fluid in the stomach after giving the bismuth mixture as a gruel or pudding and also by the two-capsule method.

Achylia, the opposite of hypersecretion, may cause similar symptoms. I wish to warn against

making a diagnosis after only a single aspiration, as the psychical influence may change the chemical aspects of the gastric secretion and give a wrong picture.

Disturbances in the secretion of gastric mucus may cause similar symptoms. These may be amyxorrhea (absence of mucus) or gastromyxorrhea (hyperproduction of mucus). The former is extremely rare; it may show normal or low acidity, the stomach contents are easily filterable, and the food particles show no tendency to clump or to adhere. The increase in the mucous secretion in the second condition may be continuous and, as a rule, without subjective complaints. It may also be of an intermittent type, resembling or even replacing an attack of gastric crisis in tabes. The fasting stomach shows a mucous content of more than 25 c.c.

Chronic gastritis sometimes leads to attacks of cramp-like pains, especially after coarse or heavy meals. This may be a result of the achylia or acid gastritis. Sometimes the abnormal condition of the gastric mucosa may be the causative factor. In carcinoma of the stomach and other atrophic gastrites, we find a special type of intermittent pains in which the patients state that their stomach is rapidly turning around, and these are followed by the welling up in the mouth of a watery fluid.

Cramp-like pains in the epigastrium may be

a sign of pyloric stenosis. The stenosis may be due to a compression of the pylorus from without, changes in the wall itself, or obstruction from within. The picture may very much resemble gallbladder colic. The pains may appear two to three hours after meals, sometimes also at midnight, and may radiate to the right shoulder. The diagnosis will be made on finding retention or stagnation of food, retention vomiting of putrid contents, and stiffening or peristalsis of the filled stomach. Sometimes there is a feeling as though the pains are being pulled from left to right. In atypical cases, the pains may remain in the left or right epigastrium or even on the midline and radiate to the left shoulder-blade or travel girdle-like to the left.

I wish especially to point out those cases in which there is no previous complaint, but which suddenly show a stomach cramp and which are, in reality, a relative stenosis which has existed for some time but which now manifests itself by dilatation of the stomach and stagnation of its contents, especially after a rich meal. After vomiting of the contents, the patient may be relieved and present no symptoms for several weeks or even a month, until a similar attack again appears, so that we see the picture of an intermittent pyloric stenosis. Sometimes, however, the condition is not relieved, and surgical inter-

ference must be instituted, as, for instance, in cases of gastric tetany.

Among the acquired types of pyloric stenosis in adults we must point out one type which comes on at middle age. It is called stenosing pyloric hypertrophy, stenosing gastritis, or hypertrophic pyloric stenosis. It is not yet known if the hypertrophic gastritis is the only factor causing the stenosis or whether we are dealing with a congenital defect which has remained latent. The picture resembles that of a stenosis by a gastric ulcer. As a rule, we find sub- or anacidity, and at times occult malena. Symptoms of stenosis are variable, and intermittent and a pyloric tumor is not an uncommon finding. There is, also, a real congenital type which produces a stenosis in early infancy. In these cases pains (pylorospasm) are rather exceptional.

Not only pyloric stenosis, but stenosis in the body of the stomach (hourglass stomach) may show the symptoms of gastric ulcer as before described, and it makes no clinical difference whether the condition is anatomical or functional in origin. X-ray findings are of more value in the diagnosis of this condition than are the physical signs.

Furthermore, the genuine acute dilatation of the stomach may produce violent somach cramps early in the onset and may last for sev-

eral hours. Such acute dilatation may occur after operations on the abdomen, prolonged narcosis, severe and exhausting diseases, overloading of the stomach, and acute arteriomesenteric obstruction.

I wish to mention two other causes, bleeding into the stomach, especially if the stomach has previously had an abnormal shape, such as after scar contraction and compression neuritis of the left splanchnic nerve, which may be caused by pressure from a tuberculous mass. The acute dilatation may be diagnosed by observing the prominently dilated stomach in an otherwise concave abdomen, enlarged area of tympany on percussion, ability to produce splashing sounds all over the stomach, high position of the left diaphragm and heart, severe vomiting which may be continuous and gushing, no disturbance in the passage of feces and flatus, unquenchable thirst, shock, and absence of abdominal rigidity. The findings on aspiration or X-ray will help to confirm the diagnosis as well as the fact that the symptoms sometimes regress on assuming the knee-elbow position or lying on the right side. Vomiting will, of course, be absent if the stomach is empty, as in cases after narcosis. In such cases there is a striking enlargement of the area of gastric tympany and an escape of air on using the stomach tube.

Kinking of the pyloric or duodenal region

may occur in cases of gastric or duodenal ptosis and in acute overloading of the stomach. There are epigastric pains which radiate to the back and may even resemble acute pyloric obstruction, but the differentiation will be made with the X-ray. A gastroptosis, even without kinking, may produce such epigastric pains to the left of the midline. The mere finding of a gastroptosis of itself does not justify the assumption that the symptoms are due to this finding, unless we can rule out such organic lesions as ulcer, carcinoma, cholelithiasis, etc. In addition, we find the typical symptoms of ptosis such as a sensation of fullness or heaviness in the epigastrium before the real pains begin. These appear periodically after meals and are worse in the upright position or when the patient is walking downstairs, and are relieved by raising the stomach either by a bandage or with the hands. The pain depends rather on the quantity than on the quality of the food; small portions of poorly digestible foods will be well borne, while large quantities, even of milk, will produce this pain.

As previously mentioned, pylorospasm may produce cramp-like pains. This spasm may be caused by the various anatomical and functional lesions of the stomach and by extragastric lesions such as appendicitis, cholecystitis, duodenal ulcer, spastic constipation, intestinal para-

sites, diseases of the central nervous system, as tabes and intoxications, as chronic nicotinism, or it may be purely the result of a functional disturbance. The clinical findings in these cases are pains radiating from the epigastrium to the right, appearing rather late after meals (two to five hours), or perhaps without any relation to food at all. It may appear at intervals of several weeks and later at more frequent intervals. They are relieved by food, soda, and local heat; vomiting may be present, and peristalsis and stiffening may also be seen. Hypersecretion and stagnation may be absent for a long time or remain entirely latent. The spastic, contracted pyloric ring may, at times, be palpated, and the diagnosis will be supported by the use of X-rays after and before the use of papaverine.

In regard to neoplasms of the stomach, we must mention the fact that cramp-like pains may appear before symptoms of pylorospasm occur. Marked pains, in my opinion, point rather to a sarcoma than to a carcinoma of the stomach if the general picture of carcinomatous disease of the stomach does not fit the case very closely.

The description of the pains in ulcer applies just as well to cicatrized or nearly cicatrized cases of ulcer, except that the acute bleeding from the gastrointestinal tract will be absent. The differentiation of scar conditions from peri-

gastritis of any origin will be very difficult. In favor of adhesions are the X-ray findings, a palpable tumor which is caused by the adhesions, the presence of a fibrous pleurisy, pericarditis, mediastinitis, peritonitis, local trauma, or diseases of the stomach or other organs which may cause adhesions. The pains are pulling rather than cramp-like in nature, depend more on the quantity than on the quality of the food, and bear a close relation to certain movements or positions of the body. Local tenderness on percussion or palpation is absent or indefinite, and malena is absent. The pains in adhesions are sometimes rather capricious, and may, therefore, be mistaken for those due to a neurosis.

The perigastritis may be purulent as well as adhesive. The former condition produces cramp-like pains after meals, and there may be a tumor of about the size of an apple, which may be mistaken for carcinoma. The tumor will, however, show a striking tenderness on palpation, and there will be fever.

The diagnosis of benign tumors of the stomach, such as polypus, may be made only when we obtain pieces of the tumor tissue on aspiration of the contents of the stomach. These tumors produce crampy pains, but no characteristic symptoms.

There is another condition which may produce cramp-like pains. The pain is not so severe and

feels rather like a pressure or sensation of tightness, such as is felt in the distention due to gastric meteorism. We see this condition in the decomposition of food with gas production in organic stenosis of the pylorus. The patient complains of a sensation of anxiety, faintness, palpitation, chilliness, and sweating. This condition lasts until the gas finds its way out either through the cardia or pylorus. Aspiration produces immediate relief with the escape of a stinking gas. Such a pneumatosis of the stomach may be purely functional, as in air swallowers. The pains may hinder respirations, are located in the epigastrium, may radiate to the back or both flanks, and disappear after passage of gas. No spasm of the pylorus seems to be present in many cases; instead, we find a spasm of the cardia or middle part of the stomach.

Temporary cramp-like stomach pain must also remind us of the possibility of involvement of the blood vessels in this region and especially of arteriosclerosis of the arteries of the stomach or of the abdominal aorta, with narrowing or traction of the branches of the latter at their origin as well as aneurism of the abdominal aorta or its branches. The pains may be pressing, burning, or tearing in nature, and may last but a few minutes. Sometimes there appears to be a relation to meals, as the pains appear one-half to one hour after eating, es-

pecially when the food is of a gas-producing nature. Nausea may be present, but vomiting is rare. In some cases, however, there is no relation to meals, and the pains may appear at any time of the night or day. The pains may also appear at intervals of weeks or months, as in gastric ulcer, and even hematemesis may occur, which is a result of sclerosis of the vessels or erosions which are caused by the narrowing of the vessels. Some cases resemble carcinoma with the anorexia, loss of weight, and even cachexia. Anacidity may also be present.

The fact that we find sclerosis in other places, dilatation and hypertrophy of the left heart, increased blood pressure, and evidence of sclerosis of the abdominal aorta will be of a certain value, but, of course, these signs are not decisive, as they may be concomitant conditions which exist along with a gastric ulcer or carcinoma. More important for the diagnosis is the fact that there was a period of flatulence and meteorism for weeks or months before the onset of the painful period. During this pre-painful period, the patient feels distended after meals and feels relief after belching. Of the greatest value in the diagnosis is the fact that the pains appear not only after food, but also after quick or strenuous motion, sometimes even after an after-dinner walk. These pains are relieved when the patient lies down. Furthermore, we

may consider the therapeutic effect of diuretin or theobromine. Hyperacidity as well as hypersecretion point against arteriosclerosis of the vessels.

Very similar attacks occur in chronic nicotinism and are partly a result of a vasoconstriction. The pains in chronic nicotinism may radiate to the chest or back, diarrhea and frequent desire for a bowel movement may be present. The attack may end with a cough, the so-called stomach cough. I wish to point out that the most injurious form of tobacco use in this sense is chewing, less so the smoking, and very little of taking snuff. Furthermore, it is not necessary to use large quantities of tobacco, as the effect depends rather on the idiosyncrasy of the patient than on the amount used. Other valuable signs of chronic nicotinism are early exhaustion, pains in the legs, tremor, meteorism, enteralgia, palpitation, arrythmia, retrobulbar neuritis, narrowing of the visual field for green and red, and headache in the occipital region resembling migraine or vertigo. The X-ray may show a gastrospasm, just as may be seen in sclerosis of the arteries of the stomach, in gastric or duodenal ulcer, tabes, tetany, chronic lead poisoning, reflex form disease of other abdominal organs and neuroses of various sorts. Gastrospasm from chronic nicotinism as well as from the other causes mentioned may

manifest itself clinically by severe attacks of pains which may radiate to the back and recur at intervals of weeks for a period of years.

In passing, I wish to mention a cause for striking and obstinate epigastralgia which can hardly be influenced by therapeutic measures and which may be associated with enteralgia, flatulence, and meteorism. This condition is hypoplasia of the arteries, especially of the splanchnic vessels. This affection may be suspected when we find the usual symptoms of status thymico-lymphatico-hypoplasticus. These are hypertrophy of the lymphatic organs, such as the glands, the follicles on the tongue, and all the tonsils. There is hyperplasia of the thymus, Ω formation of the epiglottis, abnormal narrowness of the vessels, absence of jugular pulsation of the aorta and an abnormally small heart in spite of the fact that it may be hypertrophied. Finally, there are failures of development of the mature sexual characteristics, or signs of a heterologous sexual nature, as, for instance, the female hair type at the pubis or female formation of the mons veneris, sparse beard, or absence of hair at the anus or perineum, rounded form of the arms and thighs, abnormally high voice, small and soft testicles and small penis. The masculine features in the female patients are of the same importance.

Gastralgia may also occur as a result of dis-

ease of the nervous system. In this connection, I wish to mention the gastralgias seen in anemia, especially chlorosis, and in pulmonary tuberculosis. The dyspeptic complaints and gastralgias in chlorosis are explained by most authors on the basis of a gastric ulcer. According to my experience, however, gastric ulcer is rare in general chlorosis, and we must explain the pains in this condition by hyperacidity or nervous hyperesthesia of the stomach. The subjective symptoms closely resemble those of gastric ulcer. They are not uncommonly produced by psychical emotion, physical exertion, or menstruation. It is characteristic that the entire stomach area is tender, and this tender area may be enlarged by artificial inflation of the stomach. If we find only a localized tenderness, it will be chiefly in the region of the cœliac plexus. Superficial pressure or very light percussion may cause more intense pain than deep pressure. The characteristic, segmentary, skin hyperesthesia of *Head* is absent. The pains do not radiate and are not influenced by change of position. Finally, we may note the effect of the galvanic treatment of iron, or iron and arsenic. The sequence of the symptoms is important in that in chlorosis there are at first disturbances or anomalies in menstruation, pallor, general fatigue, and palpitation, while the stomach complaints appear later. In gastric

ulcer the sequence is more likely to be the reverse.

Pulmonary tuberculosis plays even a more important rôle in the production of epigastralgia than does chlorosis. In not a few cases, the gastric disturbances are the first symptoms of pulmonary tuberculosis, and they may be mistaken for gastric ulcer. In addition to the usual symptoms of incipient tuberculosis in cases where the gastric manifestations predominate, there are two which are of great importance, namely, tachycardia, which is the opposite of the bradycardia one often finds in gastric ulcer, and tenderness of both vagi in the neck, a sign of toxic neuritis of this nerve. There is sometimes tenderness of the cervicobrachial plexus above the clavicle. There may be increased muscle tonus over one or the other lung apex, and the trapezius and sternocleidomastoid may be tender on pressure or percussion. Cough appears regularly after meals, especially after supper. Sometimes the cough is produced immediately after intake of food and is a result of the irritation by the food of the vagus supplying the œsophagus or stomach, and transmission of this irritation to the branches of the nerve going to the lungs.

Furthermore, the gastric pains are favorably influenced by improvement of climatic conditions. The tachycardia may be replaced by a

bradycardia if we are dealing with a compression irritation of the vagus nerve. This compression may be due to enlarged mediastinal glands, scar tissue, or mediastinal pleurisy. In these cases such a neuritis of the vagus may even produce hematemesis as a result of a trophic degeneration of the mucosa as well as pains, pylorospasm, and retention, as demonstrated by the X-ray. The sequence of symptoms will also be of importance, as there will appear first the gastric and later the pulmonary symptoms, and the objective signs from both regions will be present.

Finally, I wish to mention that it is not rare to find a combination of gastric ulcer and tuberculosis, or perigastritis on a tuberculous basis or tuberculous ulcer.

There are other causes for affections of the vagus with epigastric pains, as, for example, in lead poisoning affecting the gastric branches of this nerve. I once saw an affection of the mediastinal portion of this nerve, caused by an aneurism of the arch of the aorta. In addition, central affection of the vagus may occur in brain tumors, and more commonly in disease of the spinal cord, as in the gastric crises of tabes. There will be no difficulty in diagnosing the typical cases, but there are often atypical forms. These crises may be of short duration, one to two hours, with or without vomiting, the onset

and termination may be gradual, the attacks may be repeated at intervals of days or weeks, or it may represent just a single attack. We must therefore examine the central nervous system in all cases of epigastric pains, especially the pupils and reflexes. If there is any doubt, we should examine the cerebrospinal fluid for syphilis, albumin content, number and types of cells, *Nonne-Appelt, Pandy,* and collodial gold tests.

The sympathetic nerves may cause epigastric pains in the same way as is seen in affections of the vagus. We must mention the genuine neuralgias of the cœliac plexus, and the epigastric pains in *Grave's* disease and in angioneurotic edema. The latter is sometimes associated with intense gastric pains, nausea, and vomiting, but the diagnosis is made on the other typical signs seen in the skin, visible mucous membranes, and joints.

Other forms of nervous epigastric pains are the nervous acid hyperesthesia of the stomach, in which the complaints are like those of hyperacidity in gastric ulcer, and in which the pains are relieved by alkalies. The chemical examination will, however, show a normal or subnormal acidity.

We spoke of the differential diagnosis of the gastric diseases in the previous paragraphs. We shall now discuss diseases of other organs

or tissues which may cause pain in the epigastric region.

The appearance of pains shortly after meals or after a dietetic error with tenderness are not distinctive only of gastric disease, as they may also occur in such diseases as cholelithiasis. Cold foods or drinks especially may cause pain in the gallbladder or liver. Complete relief of pain after vomiting points, as a rule, to gastric disturbance, while the pain may be only slightly or not at all relieved in gallstone disease by this act. In some cases of gallstones in which there is an accompanying pylorospasm, there will be relief of the pain after vomiting. Except in cases of phlegmonous gastritis or acute perigastritis, increase of temperature will always suggest either cholecystitis or periappendicitis. Radiation of the pain to the lower abdomen speaks against gastric disease, except in cases of gastroptosis of a severe grade. In regard to appendicitis, I wish to add that the fact that the patient recovers immediately after the attack and may even be able to go home does not point against a possible destructive perforative appendicitis. This is especially so if the perforation has occurred in a previously walled-off space.

I wish to mention that hematemesis may occur in appendicitis, in which case it is caused by retrograde emboli into the stomach, causing

superficial ulcerations. It may also be a result of a toxic necrosis of the gastric mucosa. Of greatest importance in such cases is the location of the local tenderness and rigidity. Great difficulties will be met when gastric ulcer and appendicitis exist at the same time.

In regard to cholelithiasis, we must remember the principle that stomach cramps in the left epigastrium with tenderness on pressure and percussion over the same area and with rigidity of the left upper rectus all point to a gastric affection while, on the other hand, subjective symptoms in the right epigastrium may be due either to gastric ulcer or to cholelithiasis. When there are subjective symptoms in the left side, but no objective findings, we must remember the possibility of a gallbladder affection. This localization of the pain on the left side has been variously explained. We must first of all consider an abnormal location of the gallbladder, stone in one of the bile ducts in the left lobe of the liver, and stone in the common duct, although in this latter case the pains are rather lower down towards the mesogastrium. *Gerhardt* explained it by simultaneous, acute congestion of the left kidney. I think that this abnormal localization of the pains is caused rather by the accompanying gastrospasm. Finally, we must consider the possibility of an accompanying pancreatitis arising via the lym-

phatics from the gallbladder. As evidence for gastrospasm in gallbladder disease, we have the X-ray findings and, at times, such signs of gastrospasm as intermittent stasis, palpable tumor, etc.

The findings pointing to cholelithiasis are dyspeptic symptoms in general which are not relieved by vomiting, together with icterus, itching of the skin, long duration of the attack of pain, increase of the pain on deep inspiration, or even inability to breathe deeply, sudden cessation of the pains, radiation to the right side of the back or shoulder, chill, fever, tenderness over the gallbladder region, skin hyperesthesia over the liver, both anteriorly and posteriorly, and reflex rigidity of the right upper rectus muscle. Meteorism of the stomach may be present, the pains may be increased when the patient is on his left side, less often when on his right side, achylia is rather common, there may be enlargement of the liver with tenderness of this organ on deep pressure or percussion, and there may also be a perihepatic rub. Occult malena may be present, although it speaks rather for an ulcer, due either to ulceration of the walls of the gallbladder or ducts in the course of a symptomless perforation into the bowel or stomach. In this instance there may be manifest or occult hematemesis. Other possible causes for bleeding are capillary, passive hyperemia caused

by pressure of the enlarged gallbladder on the duodenum, or a pylephlibitis of the portal vein with thrombosis. Chronic icterus may of itself lead to a hemorrhagic diathesis and malena.

We must also consider œsophageal and pancreatic diseases as possible causes of epigastralgia. Among the œsophageal causes are the cardiospasm due either to a peptic ulcer, to a beginning neoplasm or œsophagitis from any cause whatsoever, or to functional or anatomical disease of the nervous supply, especially of the vagus. Carcinoma or ulcer of the lower part of the œsophagus may cause epigastric pains even if there is no cardiospasm. The pains may radiate to the shoulder-blade and are increased by the intake of food. Dysphagia may be absent. The cardiospasm produces a cramp-like pain, located behind the xyphoid, or in the angle between it and the costal arch. It may occur only during swallowing or one to two hours after meals. We may be able to find the obstruction to the passage of food. The vomitus shows no HCL, but may contain lactic acid and lactic acid bacilli as signs of stasis. Œsophagoscopy and X-ray will further clear up the diagnosis.

We may meet with great difficulties in distinguishing pancreatic colic from gastric or hepatic colic. The cause for such colic is obstruction or narrowing of the pancreatic duct

either by a gallstone low down in the common duct, pancreatic stone in the duct of *Wirsung,* compression from the outside, as from a tumor or infiltration, bleeding or necrosis in the pancreas, acute or chronic inflammation, scars, abscess, pancreatic cyst, and, occasionally, parasites in the ducts.

The pains may be very marked and are sometimes uninfluenced even by morphine. The pain may be accompanied by symptoms of shock. We may consider pancreatic disease if the patient complains of milder colics which are situated deeply in the abdomen. Of special importance is the finding of severe diarrhea during the attack of colic. If there is a palpable cyst or tumor, the diagnosis is easy. The finding of concretions of calcium carbonate and calcium phosphate in the stools also speaks for pancreatic disease. In cases of complete obstruction of the pancreatic duct we find signs of pancreatic insufficiency, such as a stool of acid reaction, gray color, salve-like consistency, and abnormally large quantity in each bowel movement. Fat may sometimes be seen in the stools, and it resembles fluid oil. Even as much as sixty per cent. of the entire intake of fat may be found unabsorbed. We also find an abnormally large quantity of neutral fat drops, and we may provoke a fatty stool by giving a fat meal of 250 grams of butter with 250 grams of gruel.

In finding fatty stools, we must remember that icterus, amyloidosis and tuberculosis of the intestine or mesenteric glands may also cause fatty stools even when the pancreas is normal. The presence of much striped muscle in the stools after *Schmidt's* test meal is of diagnostic importance but is also found in increased peristalsis of the bowel or atrophy of its mucosa after a severe catarrh. *Schmidt's* nuclein test may also be positive. After an oil-test breakfast there will be no trypsin in the aspirated stomach contents and in the stools. Absence of indican in the urine, in spite of a meat diet and normal intestinal motility, is characteristic. Ptyalism, glycosuria or alimentary glycosuria, maltosuria, and alimentary lecithinorrhea may be found. Adrenalin in the eye causes mydriasis, and we occasionally find extreme hunger and thirst. Urobilinuria and even bilirubinuria are not to be considered as pointing against pancreatic colic, as compression or constriction of the pancreatic duct may occur from causes in the common duct with accompanying damage of the liver cells.

If such signs of pancreatic insufficiency or palpable tumor are not present, we will be able to make only a tentative diagnosis. Pancreatic patients are usually stout people, and are often chronic alcoholics with arteriosclerosis or history of previous gallstone disease, and sometimes

with a cirrhosis of the liver. Other and less distinctive signs are polyuria, restlessness of the patient's motor system, and sometimes hallucinations or delirium. The pains radiate to the back, above the sacrum, or in a fan-like manner downwards toward the lower abdomen, sometimes even to the wings of the ilium.

The radiation may be girdle-like and is due to an involvement of the cœliac plexus. The pains may show two different types, either intermittent with intervals of partial relief for one or two days and with no complete freedom from pain during these intervals, or continuous, intense, and of such increasing severity that the patients may have to crouch in order to obtain relief. Both types are found most frequently in indurative pancreatitis or in carcinoma of the body of the pancreas. Sometimes a tumor from some other place, but infiltrating the pancreas, may cause similar effects. Carcinoma, beginning in the head of the pancreas and secondarily involving the body, may also cause such an attack. The intermittent type will very much resemble the crises of tabes or of aneurism of the abdominal aorta. We may meet with pains of a mild colicky or pressing nature, as signs of hyperesthesia of the cœliac plexus, resulting from anatomical or functional disease of the pancreas. Such symptoms are also

found in gastric or pancreatic achylia, hypothyroidism, and general neurosis.

We must differentiate between the gastric crises of tabes and carcinoma of the pancreas. Tabes generally appears at long intervals, even weeks or months, and the tabetic attack itself lasts longer, sometimes as long as a week. The blood pressure is increased if there are vascular crises as well, and the usual signs of tabes may also be seen.

Aneurism of the abdominal aorta may be confused with carcinoma of the pancreas, because the pulsation of the aorta in the latter condition may be very prominent and the overlying pancreas may transmit this pulsation from the aorta and cause a systolic compression murmur over the vessel. The diagnosis will be based on the fact that the pulsation in aneurism is expansile, while in tumor the heaving is just in one direction. Furthermore, there will be no retardation of the femoral pulse in tumor of the pancreas when compared with the apex beat or radial pulse. The course will also be of some value, especially the cachexia and loss of weight, while in aneurism the patient may feel well for years. The pains in abdominal aneurism occasionally radiate to the lower extremities, especially when the patient is walking, and are dependent on the position of the body. Some aneurism patients learn that the pains disap-

pear on assuming certain positions, while pancreatic patients always crouch.

In passing, I wish to mention that aortitis and sclerosis of the abdominal aorta with narrowing of the beginning of the cœliac artery may produce similar crises. Such crises have been observed in chronic malaria and were even associated with hematemesis.

In discussing ulcerations of the upper gastro-intestinal tract, I wish to point out that there are gastric ulcerations in tabes which are a result of affection of the vagus.

Ulcer of the jejunum and of the duodenum may closely resemble one another clinically. The former may be syphilitic in origin or it may be the result of a gastroenterostomy.

The cramp-like pains of duodenal ulcer are characterized by their periodicity, occurring most often during the cold seasons, sometimes under psychical effects, remain four to six weeks, and then disappear for a month or even for a year, to again reappear as before. We observe that the intervals become shorter as the disease progresses. The attacks begin, as a rule, two to five hours after meals, rather earlier after fluids than after solids, and we sometimes see that foods which are difficult to digest cause no pains, while a bland diet tends to aggravate the symptoms. The pains also appear when the stomach is empty, especially at night, and

this so-called hunger pain may be relieved by food or alkalies. This hunger pain is by no means pathognomonic for duodenal ulcer, as many authors assume. It also occurs in gastric ulcer, simple hyperacidity, digestive hypersecretion, achylia, carcinoma, periduodenitis, pericholecystitis, jejunal ulcer, chronic periappendicitis, tuberculosis of the mesenteric glands, parasitic diseases, such as tæniasis and occasionally, in affections of the colon, as carcinoma.

Anacidity and hyperacidity occur in duodenal ulcer, but hyperacidity is the rule. Hypersecretion is rare. Eructations and heartburn are rather common.

Another important symptom is the acute malena, either in the stool or in the duodenal contents which are removed with a duodenal tube. This bleeding may be brought about by a coarse, irritating diet. It is generally supposed that duodenal ulcer produces occult blood in the stools but none in the vomitus, and that blood in the vomitus points to a gastric ulcer. This is not always true, as the patient may vomit blood, especially if there is a duodenal stenosis, while a gastric ulcer patient may have only malena but no hematemesis.

All the above-mentioned signs are not characteristic for duodenal ulcer, as they may also occur in gastric ulcer near the pylorus, and we must, therefore, consider them as signs of ulcus

juxtapyloricum. Of greater value for the diagnosis of duodenal ulcer will be the objective tenderness on palpation or percussion to the right of the midline, about one and one-half finger-breadths to the right of a point about midway between the xyphoid and the navel. Sometimes this tenderness must be searched for by a thrusting palpation with the tips of the fingers. The pains may radiate to the right chest, the back, to the right of the spine or to the shoulder-blades. Hyperesthesia of the skin may be present to the right of the tenth to twelfth thoracic vertebra. We must also remember that duodenal ulcer is common in the male.

A tympanitic area which is constant and circumscribed may be found over the dilated portion of the duodenum proximal to an existing stenosis. The X-ray may sometimes decide in cases of doubt, and is to be considered as a valuable help in all cases. The X-ray findings are early food expulsion from the stomach, with a food residue six hours after ingestion of the test meal in spite of the hypermotility. The duodenal cap is persistently filled although the stomach is empty, the cap is distorted, and a *"Nische"* may be seen in penetrating ulcer. The usual signs of stenosis will be seen if the duodenum is narrowed.

The differentiation between duodenal ulcer

and cholelithiasis rests on the following points. Attacks which always last for several days without periods of appreciable relief point to gallstones, as does a large liver which shrinks after the termination of the attack. Generally speaking, icterus points to cholelithiasis rather than to duodenal ulcer, but icterus is often absent in gallbladder disease and may be present in duodenal ulcer if it is near the papilla of *Vater*, where it causes inflammation or adhesions with obstruction to the outflow of bile. Urobilinuria is of greater value. If it is present during or after such an attack, when there was no previous icterus, it points to gallstones. Fever may occur in acute periduodenitis in duodenal ulcer.

In making the diagnosis of duodenal ulcer, we must remember that the etiology need not be that of a peptic ulcer. Such an ulcer may follow burns, arteriosclerosis, uremia, septic diseases, tuberculosis, and syphilis.

Fibrous periduodenitis may cause pains which resemble those in duodenal ulcer, even if the former condition is due to ulcer, pericholecystitis, congenitally short hepato-duodenal ligament, or syphilitic scars. The constant absence of malena and the X-ray findings will be of importance in distinguishing it from duodenal ulcer. Hypersecretion of the duodenum and pancreas point rather to ulcer than to a periduodenitis. Periduodenitis below the papilla of *Vater* will show

the characteristic features such as signs of an interference with the gastric emptying, plus the constant presence of bile and pancreatic juice into the stomach contents.

Rare causes of a duodenal stenosis are primary carcinoma of the duodenum, primary tumors of some other nature in this region, and congenital anomalies.

Similar epigastralgias may be brought about by a stenosis caused by extraduodenal lesions but without the presence of a periduodenitis. These are tumors of the pancreas or gallbladder, neoplastic or tuberculous glands, wandering kidney, and retroperitoneal tumors, etc. Periduodenitis as well as jejunal ulcer may occur after a gastroenterostomy.

Other complications may result from this operation, such as adhesions between the stomach and colon, with narrowing of the latter, gastrocolic fistula, incomplete jejunal stenosis, and too rapid passing of food from the stomach into the bowel. All these conditions may produce epigastralgia. In all diarrhea occurs shortly after meals, and the patients complain of dyspeptic symptoms.

We shall now consider hernia as another cause for epigastric pains. The first to be mentioned are epigastric hernias and hernia of the lateral abdominal wall. These cause cramps which sometimes occur after meals, and which may be

accompanied by vomiting. These symptoms also occur after motion or upon shaking up of the abdominal contents, as in coughing. The pains may be localized to the hernial region, or they may radiate, girdle-like, around the thorax towards the spine or upwards to the shoulders, rarely towards the bladder or rectum. In practically all cases we find that certain positions, especially the supine, considerably relieve the pains. We may surmise the origin of these pains when we remember that the hernial contents consist of omentum or subserous lipomata which are connected to the peritoneum by a fibrous cord. As evidence that these are really the cause of the pains, we find that the hernia is tender during the attack or during contraction of the abdominal muscles. We must remember that the mere presence of these hernias should not prevent us from looking for other causes of the epigastric pain.

Postoperative hernias may also cause such symptoms. Hernia following trauma to the abdominal wall may likewise cause pains. Dyspepsia and pains may be due to compression and adhesions in the hernial sac. These symptoms can often be greatly relieved by an abdominal support. Femoral or inguinal hernias or large inguinal rings may also cause crampy pains in the epigastrium. The cause for these pains may be suspected when the patient com-

plains that the stomach cramps appear while he is walking about. A periodic tenderness of the spermatic cord or a unilateral tenderness of the rings may also point to the nature of these hernial disturbances.

There is another type of hernia which causes cramp-like epigastric pains, which radiate to the left shoulder. This is a diaphragmatic hernia. We must assume, in these cases, that there is a stretching of the abdominal organs which are displaced into the thorax, this being especially the case with the stomach. We will therefore find the pains after large meals or bodily exertion. The patient will show signs of microgastria, that is, the patient can take only small quantities of food, he feels that the stomach quickly fills up, and he has a tendency to meteorism, temporary dyspnea, anxiety, and oppression. Objective examination reveals a dislocation of the heart and lungs, high-grade tympany with changes in character and extent and which reaches high up, depending on the fullness of the stomach. A bubbling sound may be heard over this tympanitic area in the thorax, and the X-ray will further show signs of this condition. Hematemesis may occur either as a result of disturbances in the circulation of the stomach or from real gastric ulcer due to a tearing or kinking of the stomach.

We must also mention *Addison's* disease, of

which there are two types. This may produce epigastric pains which also run along one or both sides of the hypochondrium, or the picture may closely resemble the gastric crises of tabes, but is accompanied by vomiting and diarrhea.

Mesenteric and omental cysts and tumors may cause crampy, epigastric pains. More important is the fact that tuberculosis of the mesenteric glands may lead to colicky or constant pains in the upper part of the abdomen or ileocecal region. This so-called tabes mesenterica, which occurs practically only in the young, will be diagnosed by the pain, tender, palpable, knoblike tumors, rise in temperature, which may be of a hectic character, anorexia, pallor, loss of weight, and the striking distention of the abdomen with otherwise severe emaciation, often vomiting during the attacks, and sometimes fatty diarrhea or light-colored stools which may be due to obstruction of the mesenteric lymphatics by the enlarged gland.

Such cases of enlarged mesenteric glands may simulate duodenal ulcer for years. These cases may show a local reaction after subcutaneous injection of tuberculin, in the form of cramps in the stomach region.

Cardiovascular and respiratory disease may also cause epigastric pains. Angina pectoris is discussed elsewhere. Paroxysmal pulsation of the abdominal aorta may cause such pains,

especially in females. The pains may be so intense as to be mistaken for gallbladder colic. It is characteristic that the patients complain of an epigastric pulsation which may reach to the navel and which may accompany the pains. The patients feel as though the heart has fallen down into the abdomen. We may see the exaggerated pulsation of the abdominal aorta during these attacks, while this vessel may appear entirely normal during the intervals.

Epigastric pains may, furthermore, be found in increased blood pressure, dilatation of the right side of the heart, especially when it is a result of emphysema, mitral disease, myocarditis, and, generally, in all cases of functional disease of the tricuspid valve. The patient complains of a constant, moderate pressure in the epigastrium, which may be explained by the passive hyperemia of the liver, especially if there is increased urobilin in the urine and tenderness which is most marked in the left lobe of the liver. This constant pain or sensation of pressure may develop into intense cramp-like pains which extend behind the sternum. Exacerbations may be due to physical or psychical exertion or emotion. The regular meals will, however, not influence the pains, while potassium iodide may afford relief.

The differential diagnosis between primary myocarditis on an arteriosclerotic basis and

arteriosclerosis of the stomach arteries or of the abdominal aorta may be very difficult, as both conditions cause pain on bodily exertion. In the sclerosis of the abdominal aorta, there will be no continuous pain in the intervals, the aorta itself may be tender, and the pain may be influenced by food and will not be produced by pressure on the epigastrium. The fact that the pains do not reach behind the sternum has even more diagnostic value in disease of the abdominal aorta. The facial color is of importance in that all cases with increased pressure in the right heart show a cyanotic color during the attack, and the patient may become livid in the later course of the disease.

There are two more conditions under which the liver may be responsible for epigastric pains in heart lesions. One is the fibrinous perihepatitis due to the passive hyperemia, and the other is an abrupt liver enlargement caused by an acute passive hyperemia of the liver, in the course of an acute dilatation of the heart. In the perihepatitis, we find the perihepatic rub, pain on movement of the diaphragm, as in deep breathing, coughing, or sneezing, tenderness in the intercostal spaces, and fever and asynchronous breathing on the two sides of the chest. The latter sign may be a result of a previous passive hyperemia of the liver. In regard to the before-mentioned abrupt liver enlargement

which is due to passive hyperemia, we must remember that there may be severe, cramp-like pains extending behind the sternum, with cold sweats, vomiting, pallor, cardiac arrythmia, indrawn abdomen, and exquisite tenderness of the epigastrium; all of which may resemble the pain of a perforated peptic ulcer or acute pancreatitis. All these symptoms may disappear if the heart condition is improved by cardiac therapy.

Disease of the small bowel and colon as far down as the sigmoid or affection of their peritoneal coverings may cause epigastric pains. These pains may even have a definite relation to the intake of food, appearing three to four hours after eating if the process is located below the cecum. This corresponds to the time it takes the food to arrive in this region. We often see attacks of pain immediately after eating, even if there are no adhesions to the stomach.

I cannot too strongly emphasize the point that pains may occur immediately after eating in lesions of the intestines, and I wish to repeat the words of *Trousseau,* that half of the so-called stomach pains are really caused in the colon. Of especial value is the statement of the patient that passage of gas per rectum relieves the pains, while belching has no effect, that the pains appear to travel from right to left and are not constantly located in the epi-

gastrium, but may at times be above or below the navel, and that they may not be severe but of a pinching character and are often accompanied by borborygmi in the colon, which are relieved by local heat or moderate pressure. The attack sometimes assumes a wave-like character in intestinal colic and is of short duration. The pain will cease when the bowel is empty and reappear when it is filled. The pains may also be relieved after passage of stool or flatus, and vomiting is sometimes present at the end of the attack. In this connection it is well to remember that gallstone and renal colic may produce a similar picture. Of course, in determining the origin of epigastric pains, we will have to consider such findings as tumor, vomiting, and especially colon bacilli and urobilin in the vomitus, and rectal and chemical examination of the stool.

Lead colic and mucous colitis may also produce epigastric pains. The pain in the latter condition may be produced by mucus formation in the bowel and will be characterized by intense and lasting pains and especially by the presence of membranes in the feces, particularly if they are of a tube-like formation and appear at the end of the attack. The attacks in mucous colitis may be single or repeated at intervals of weeks or months. It occurs chiefly in female patients who show a general neurosis and affection of

the genital tract. Not rarely, we can palpate the contracted sigmoid, which seems to be the place of predilection in this condition.

Such a colonic spasm may also occur as an entity by itself and not as mucous colitis, especially in the transverse colon. The epigastric pains are colicky and last several hours. In one such case in my experience, the pains were relieved only after diuretin, and I believe that in this case the condition was due to arteriosclerosis of the vessels of the transverse colon.

Renal affections may produce epigastric pains of a pressing, throbbing, or sticking nature. They occur in all kinds of affections of the kidney or its fibrous and fatty capsule, and are usually accompanied by lumbar pains. Cramp-like pain occurs only in renal or ureteral colic. The latter may also cause epigastric pains at the onset. But even under these circumstances the diagnosis will not be difficult, as the patient will, as a rule, say that he feels vague or moderate pains in the flanks with radiation along the ureters to the bladder or genitalia. We will have to look for tenderness over the kidney on deep percussion or pressure, hyperalgesia over this area, and tenderness along the ureter and testicle on the diseased side. Traces of albumin, some red blood cells, and the X-ray will support the diagnosis. The pains may ultimately spread over the entire abdomen, and

there may be severe pains in the bladder with vomiting and copious stool during the attack. The attack may last for a few hours and may be accompanied by chills and fever. The symptoms described in this paragraph may, however, also occur in disease of the intestines, especially in stenosis. I saw a case of old fibrous peritonitis of the pelvis which was caused by appendicitis and which was followed by rectal stenosis with a picture as just described.

Among other conditions of the urogenital tract which may produce epigastric pain is a wandering kidney. I wish to emphasize the fact that we are too ready to make the diagnosis of wandering kidney as being the cause of epigastric pain, especially if we can find a somewhat low or movable kidney. It is only when the pains disappear on replacing the kidney in its normal location, and where a fitting bandage will bring lasting relief, or when the pains disappear when in the horizontal position that we are justified in assuming that the wandering kidney is the cause of the trouble.

On the other hand, shaking up of the body, as in jumping or jolting in a carriage, will again produce the symptoms. Unless we have these characteristics we must first rule out all other causes, including the neuroses, before we can consider the wandering kidney as the real cause of the pain. A wandering kidney may produce

very severe, cramp-like pains in the epigastrium with nausea, vomiting and constipation. These symptoms may be due to stretching of the nerves or vessels, torsion of the ureters, or intermittent hydronephrosis. We must not forget that the wandering kidney may be diseased with tuberculosis, stone, etc. The wandering kidney may occasionally produce epigastric pains in an indirect manner by pressing on the pylorus or duodenum with resulting signs of stenosis of the gastrointestinal tract. Wandering kidney may also produce a pure reflex epigastralgia, especially in nervous people.

Another condition in which epigastric pains of this nature may occur is diabetes. The cause may be in the disease of the pancreas. The pains may appear as in tabetic crises lasting for hours or days, are very intense, and are often accompanied by persistent vomiting, nausea, vertigo, occasionally diarrhea, a marked loss of strength, and symptoms of collapse. These attacks may be due to inflammation of the pancreas or solar plexus, or to pressure or stretching of the latter by a sclerosing affection of the pancreas. It is of practical importance that such epigastralgia sometimes resembles peritonitis, especially when associated with intense headache, increased pulse rate, hypotension, and, occasionally, fever. These may be a warning signal of impending diabetic coma.

If glycosuria is present with epigastric attacks of pain we must not forget the possible relation of such a glycosuria with cholelithiasis, due either to a mechanical obstruction of the pancreatic juice or to functional or temporary anatomical changes in the pancreas, such as lymphangitis or slight inflammation. It will be important to note that the glycosuria in these cases appears only during an attack.

We must also think of the possibility of cholelithiasis, a condition not at all rare in women, when there are epigastric pains with diabetes. We must also remember that the combination of cholelithiasis and diabetes may occur in stone or tuberculosis of the kidney, pyelitis, and gout.

The epigastric pains in gout are accompanied by vomiting of bile or mucus, and occasionally by fainting. This is the so-called gastralgic gout. The pain is relieved by pressure, just as it is in nervous gastralgia. This form of visceral gout, although described, seems to be very rare. Gastralgia, combined with dyspeptic complaints, may occur as premonitory symptoms before an attack of gout in the joints and may disappear when the attack in the joints comes on. In cases where the occupation or clinical symptoms of the patient may lead one to suspect chronic lead poisoning, we must also

remember that lead gout with tophi and other symptoms will have to be considered.

Epigastralgia with headaches and vomiting may be premonitory symptoms of an attack of eclampsia. Epigastralgia may also be an aura before an attack of epilepsy or may be a manifestation of petit mal itself.

This type of pain may also occur in *Graves'* disease as a sort of visceral crisis. There are colicky pains along the colon with tenderness along the large bowel and cœliac plexus, constipation, and anorexia. The symptoms in these cases may be due to a certain extent to the enteroptosis which is such a common finding in these patients.

We must consider the acute infectious diseases as causes of epigastralgia. This type of pain may occur in malaria, and it may even be the only manifestation of the malarial attack. Mild abdominal pains may be observed a few days before an attack of æstivo-autumnal malaria, or it may occur during the attack and may be accompanied by tormenting singultus.

Gastrointestinal influenza may also cause epigastralgia. This may also be an early symptom in smallpox and is to be kept in mind when there are accompanying sacral pains, fever, headache, and various aches in the limbs. Epigastric pains are occasionally initial symptoms in rheumatism, typhus, and acute trichinosis, in which

latter condition it is associated with muscle pains and diarrhea.

Epigastric pains are frequently an early symptom in epidemic miliaria, in which condition they are constricting in nature and are also present about the region of the heart with a sensation of marked anxiety, dyspnea, and profuse sweating. Marked epigastric oppression sometimes occurs in Malta fever, anthrax of the stomach, and periarteritis nodosa. The latter condition is associated with profuse sweats and pains which are independent of the food intake. Mumps and *Weil's* disease may also cause this pain. The pains in the latter condition occur rather late in the course and are due to involvement of the pancreas. When such epigastric pains occur in sepsis with bloody vomiting and diarrhea, as well as meteorism, we will have to think of embolic erosions in the stomach. In typhoid we must suspect cholecystitis, diffuse pancreatitis, suppuration of a spleen or mesenteric gland, and perforation of a typhoid gastric ulcer. Furthermore, the pains may be due to phlegmonous or diphtheritic inflammation of the gastric mucosa, hemorrhagic smallpox, erysipelas, yellow fever, and pneumococcic sepsis.

### Acute, Continuous Epigastralgia

Our first thought in the presence of a single and very severe attack of pain in the epigas-

trium of a continuous course and associated with collapse should be a perforation of a gastric ulcer. Such perforation occurs most commonly in peptic ulcer and less often in carcinoma. We must also remember the possibility of a phlegmonous, suppurative gastritis of toxic or infectious origin. The diagnosis of the perforation is made on the following symptoms.

Of importance are the previous history of gastric complaints, rigidity of the abdominal muscles, especially in the epigastric area, shifting area of tympany over the liver region, cushion-like bulging of the epigastrium, sometimes a peritoneal rub in the liver region, coarse bubbling râles at the left diaphragm during inspiration, which are due to the presence of air and fluid in the stomach, and absence of vomiting, although there are signs of peritonitis and collapse. The collapse and pain may disappear after a few hours or days, and this may be due either to a walling off of the process or to a covering or plugging of the perforation by omentum or some abdominal organ. In regard to the localization of the pain, it is not so important to determine the area as it is to determine the radiation to the left shoulder, or posteriorly to the left of the spine as the pain may be located in the same place when due to perforation of the gallbladder, spleen, duodenum, appendix, and peptic ulcer of the œsophagus.

Perforation into the stomach from without may cause similar pains, although the condition may remain symptomless. Such a perforation into the stomach may occur in perforative peritoneal abscess, carcinoma of the transverse colon or left lobe of the liver, perforation of a tuberculous gland, and rupture of an aneurism, as of the splenic artery. We must remember that such a perforation into the stomach may occur without any appreciable symptoms at all. The diagnosis of a perforation into the stomach will be made on the resulting symptoms, such as sudden fecal vomiting, direct passage of stomach contents into the colon or vice versa, as is seen in cases of stomach colon fistula, sudden biliary vomiting, gross or occult hematemesis, and copious malena in cases of rupture of an aneurism. The X-ray findings are also of value.

The preceding compression of the pylorus may be followed by enlargement of the stomach before the perforation into the organ actually occurs. What has been said about rupture of the stomach applies equally to rupture of the duodenum. Other conditions which may produce similar symptoms are acute dilatation of the stomach and acute purulent perigastritis of any cause. The epigastritis produces very severe pains, which are sometimes accompanied by collapse, and which extend over the entire upper abdomen. The pain will be increased by

motion, especially on stooping, the sensorium may be clouded, and fever may be present. The fever, polynuclear leucocytosis or leucopenia, local tenderness or tumor mass, and disappearance of the tumor mass after vomiting will help in the diagnosis.

I want to mention two conditions which are rare: volvulus of the stomach, a condition which can hardly be recognized, and the acute phlegmonous gastritis or duodenitis. The phlegmonous gastritis may be due to a gastric ulcer or carcinoma, trauma and bacterial infection entering either via the blood stream or mouth. The symptoms of phlegmonous gastritis are the severe general symptoms of sepsis, sometimes intense chills, very sudden pain independent of bodily motion, and a tender tumor mass in the epigastrium which may decrease in size or disappear after bloody, stinking, or purulent vomiting. This vomiting is of great importance even in the absence of the palpable tumor. As this symptom also occurs after a perforation of an extragastric condition into the stomach or in carcinoma of the stomach and apparently after simple but severe catarrhal affections of the mucosa, the diagnosis will be made with great difficulty. The effects of poisoning by the various corrosives will also produce such gastrites, but they are different in their anatomical nature. Finally, I wish just to mention

that acute thrombosis of a stomach vein may precipitate such an attack.

Among the extragastric conditions causing acute, continuous, epigastric pain are perforation of the œsophagus near its cardiac end as a result of either ulcer or carcinoma. Dysphagia may often be absent in these cases, while rigidity of the upper abdominal muscles is present. In cases of rupture into the pleural cavity, we observe epigastric pains, attacks of dyspnea, vomiting, and asthmatic attacks.

I wish especially to emphasize some cardiac conditions which may produce such severe pains, which are rather pressing in character than colicky. We must, first of all, mention the true angina pectoris. If the pain begins in the epigastrium and later localizes itself in the characteristic place behind the sternum with radiation into the left arm, there will be no difficulty in recognizing the condition as angina pectoris. There are, not rarely, cases in which the pain is limited to the epigastrium with radiation towards the navel or back. The attack may last several hours or may develop into a status anginosus lasting as long as a week. We are likely to mistake this angina for a gastric disturbance, because the attack sometimes follows a dietetic error and ends with eructations. Pyrosis, œsophageal pains, nausea, vomiting, desire for bowel movement or urination, and

slight faintness may also at times occur in angina pectoris.

Of importance in the diagnosis are striking pallor during the attack, cachectic anemia, the marked anxiety, effect of amyl nitrite or nitroglycerine, history of previous attacks or evidence of previous heart weakness, and objective evidence pointing to changes in the aorta, coronary arteries, myocardium, or signs of arteriosclerosis in the peripheral arteries. The epigastrium will show no tenderness, and the abdominal respiration will be unimpaired which is in contrast to the impairment of the abdominal respirations in peritonitis, a condition which may resemble angina pectoris because of the Hippocratic facies. In passing, I may point out that the characteristic sensation of anxiety of angina may be simulated by a similar sensation which occurs in gallstone attacks.

Acute affections of the heart must also be mentioned, such as acute pericarditis and acute infectious myocarditis. Rupture of the heart into the pericardium, more rarely rupture of the septum of the heart as a result of anemic necrosis, rupture of the aorta or coronary artery or dissecting aneurism of the thoracic aorta; all these may cause epigastric pain. The decisive point in these conditions is the absence of abdominal rigidity, tenderness, and hyperesthesia of the skin, except in cases where there is acute

passive congestion of the liver. Such pain may also occur in paroxysmal tachycardia, which sometimes leads to acute congestion of the liver. Complete or partial heart block may also cause epigastric symptoms, which latter may be in the foreground. In all of these cases we will find the accompanying and usual circulatory symptoms. The same is true of aortic insufficiency, aneurism, and cardioptosis. The cause for the pain in the aortic insufficiency may be the irritation of the abdominal aortic nervous plexus by the exaggerated expansion of the wall and stretching of the surrounding plexus or by inflammation of the wall. The aorta, especially in the region of the cœliac plexus, will show marked tenderness and pain, which will be relieved on lying down or upon use of the icebag. In cases of aneurism, we will also have to consider primary diffuse affection of the aorta or coronary arteries and disease of the vagus-sympathetic system. The epigastric pains due to cardioptosis appear when the patient attempts heavy lifting.

Among other thoracic conditions capable of producing epigastric pains are acute purulent or simple mediastinitis, even when of supradiaphragmatic origin. We will think of this possibility in the presence of fever, dysphagia, symptoms of mediastinal compression, and substernal dullness. The X-ray and the presence

of a possible cause for this acute mediastinitis, such as affection of the lungs, pleura, œsophagus, lymphatics, etc., will aid in the diagnosis.

The pulmonary conditions which may cause epigastric pain are emphysema, pneumothorax of the left side, and diaphragmatic pleurisy. These pains may also be accompanied by vomiting. The diagnosis of pneumothorax will present no unusual difficulties, but mistakes are often made in diaphragmatic pleurisy, where we must carefully look for increased respirations, one-sided lagging during breathing, and tenderness of the phrenic nerve in the neck, along or near the sternal borders, or at a point at which the prolonged parasternal line intersects the prolongation of a horizontal line drawn from the tenth rib. Pressure along the lateral borders of the spine also causes tenderness, as does pressure in the tenth and eleventh intercostal spaces.

During the recent influenza epidemic we saw an acute diaphragmitis, either as an entity by itself or occurring in the course of a basal pneumonia. This may also cause the typical diaphragmatic symptoms and findings as mentioned before.

A fibrinous pleurisy on the left side may lead to a complication, the acute diaphragmatic paresis, which produces the same symptoms. In

these cases, however, the pains will be more localized to the left side of the chest or hypochondrium, and there are a catch in the breath, dyspnea, cyanosis, high position of the diaphragm, which may also be seen with the X-ray, and dislocation of the heart upwards and to the right.

## Acute, Epigastric Pains of Short Duration which Are Not Cramp-like in Nature

In this chapter I wish to discuss the sticking, boring, pressing, or burning pains in the epigastrium. Here we must first mention practically all the conditions discussed in the chapter on colicky or cramp-like pains.

A rather common cause may be a simple flatulence without any anatomical lesion of the intestine. In addition, we must consider compression of the stomach, as in megasigma congenita, which may compress the stomach and cecum. For the same reason, similar pains may be produced by tumors of the splenic flexure of the colon.

Of very great importance are acute and chronic appendicitis and periappendicitis. The pains need not be crampy or colicky; they may be only pressing in character and be relieved by intake of food. They may be so slight in degree that the patient may attach only minor importance to them. In this connection it is well to

remember that an epigastralgia with fever is nearly always of extragastric origin and is usually due to an appendicitis or inflammatory condition of the bile ducts or porta hepatis. The diagnosis of involvement of the porta hepatis will be made on the recognition of a possible cause, either present or past, such as periappendicitis, or any inflammatory or purulent condition near the root of the portal vein. There will also be signs of general sepsis, icterus, even if only of minor degree, enlargement of the liver, tenderness over the gallbladder region, acute tumor of the spleen, ascites, and leucocytosis, as well as bacteriological findings in the blood. We must remember that syphilitic disease of the portal vein may cause similar symptoms in this region.

Among the conditions arising in the liver itself are acute passive hyperemia and acute perihepatitis, especially of the left lobe or adjacent part of the right lobe of the liver. There may be a rub in acute hepatitis which has the same tempo as that of a pericarditis. The acute hepatitis in *Weil's* disease and abscess of the left lobe of the liver must also be mentioned. I saw a case of the latter after retrogression of an acute periappendicitis. Hepatic syphilis may show very severe pains with an enlarged and tender left lobe of the liver and positive *Wassermann* reaction, all of which may

disappear after specific treatment. Neoplasm or echinococcus of the left lobe may produce similar symptoms. In regard to diagnosis of enlargement of the left lobe of the liver, I think that deep percussion in the back, to the left of the vertebral column, is of undoubted value. If the perpendicular height of the left lobe with this method of percussion is more than five cm., we can suspect its enlargement, providing we can exclude extension of the right lobe to the left.

Pancreatic affections may also produce this type of pain. The reader is referred to the chapter where disease of this organ is discussed.

Angina pectoris, especially during the stage of status anginosus, may cause this type of pain. The same is true of cardiac hypertrophy due to hypertension, but the pains are transient in this case and may appear after large meals or after walking in the face of a cold wind.

Furthermore, I wish to mention the initial stage of acute tuberculous peritonitis as a possible cause of epigastralgia of this type, especially if localized in the left upper part of the abdomen and resulting either from a tuberculous pleurisy on the left side, or from tuberculosis of the mediastinal glands.

Acute circumscribed peritonitis of the parietal peritoneum may cause this pain when following

a gastric ulcer, carcinoma, or gastritis phlegmonosa. This circumscribed peritonitis may later infiltrate or perforate the wall. The diagnosis will be made by finding the possible causative factor in the stomach, circumscribed tenderness on palpation or percussion, fever, and palpable epigastric tumor; later, the local redness, tenderness, edema and swelling of the skin, absence of epigastric movement on respiration and a retraction caused by contraction of the resulting connective tissues after healing of the process.

Sometimes the infiltration may not come directly from the causative focus but may result from a further progression of the peritoneal abscess. The course may be either quiet or stormy in these cases. It is self-evident that other abscesses, such as subphrenic abscess or perforation through the diaphragm from a pyopneumothorax, may produce similar mild or severe pain. The pain will be most severe at the time of perforation through the wall in the above-mentioned cases.

Similar pains may also arise from disease of the lower end of the œsophagus. The pulmonary diseases may come into consideration when there are complications in the liver, low position of the diaphragm, or its overloading by an exudate without the latter's causing symptoms, as well as the presence of a pneumothorax

which develops without symptoms. The painless pneumothorax is found especially in pre-existing severe pulmonary disease with a shrinkage of the respiratory surface, or in cases where there is a pre-existing empyema with invasion of the lung tissue by pus. Such patients often have no complaints except a continuous, girdle-like pressing sensation in the stomach region, gastric fullness after meals, eructations, and vomiting. Sometimes the complaints very much resemble those in gastric ulcer, in that the pain appears after meals, radiates to the back, and is relieved by alkalies or food. In such cases, we must also consider the presence of possible adhesions between the diaphragm and stomach. Similar symptoms may be present in artificial pneumothorax, pleurisy on the right side, or hydropneumothorax. In a case of epigastric pain which showed similar features, the examination revealed a seropneumothorax on the right side, in which an existing fibrous mediastinitis prevented a dislocation of the heart and consequently increased the downward dislocation of the liver with resulting pressure on the stomach.

In regard to nervous affections we must first discuss the neuralgias of the cœliac plexus which may occur as a part of an hysterical picture. Such a neuralgia is characterized by a radiation of the pain along both sides of the abdomen in

its lower part, reaching to the sacral or gluteal regions. There is seldom radiation upwards or toward the genitalia. The patient may have polyuria, and the stools may be in the form of small, round pieces like those from sheep. The exquisite tenderness of the cœliac region will certainly be of importance, but we may use this symptom only in a diagnostic sense when we can exclude an organic lesion such as gastric ulcer.

Furthermore, we must not forget that retroperitoneal diseases, such as cysts or tumors of the pancreas, aneurism of the abdominal aorta, and aortic insufficiency, may all produce or be associated with such a neuralgia of the cœliac plexus. The tenderness in this region may, furthermore, be due to an uncovering of the plexus in cases of diastasis recti, abnormally relaxed abdominal walls, gastroptosis, enteroptosis, and an abnormally forward dislocated plexus, as occurs in lordosis or retroperitoneal disease. The examining hand is more likely to produce pain in these cases than in the normal people where the plexus is covered by the usual layers of organs and tissues. Polyuria, although a useful finding in neurosis, occurs also in nephrolithiasis, disease of the pancreas, and gallstone colic.

Among the other abdominal neuroses which must be mentioned are abdominal migraine and

visceral crisis of *Basedow's* disease. Enteroptosis is usually present in the latter condition. There are also cases of reflex hypersensibility in female patients at the time of menstruation or in disease of the female genitalia and sometimes as a result of an abnormally full bladder. Stretching of the peritoneal covering may be the cause of pain in the latter cases.

### Chronic Continuous Epigastralgia

If a patient complains of a constant sensation or pressure in the epigastrium, as if a stone were lying in the stomach, or of pains which are increased upon motion or in the upright position, the reason may be a simple passive hyperemia of the liver. Only occasionally will this liver condition produce an intense pain which quickly reaches its height. It is very important to know that the pains in passive hyperemia of the liver are very often the first symptom of the primary causative disease which is muscular insufficiency of the right heart, a result of acute or chronic disease of the myocardium, adhesive or exudative pericarditis with interference in filling of the auricles, direct affection of the inferior vena cava, or disease of the hepatic veins. The diagnosis of a passive hyperemia of the liver will be based on enlargement of the organ, increased consistency, tenderness on palpation, and percussion in this region and in the linea alba where

the liver is most exposed. This tenderness will closely correspond to the area of the liver as outlined by palpation and percussion, but will be most marked at the linea alba. Urobilinuria or urobilinogenuria will be very marked. The symptoms will often improve after cardiac treatment. The liver tenderness which is due to stretching of the liver will be more marked if the congestion develops rapidly. Slowly developing cases, therefore, show mild or practically no symptoms. On the other hand, if we find evidence of a passive congestion in the vena cava but without pains or enlargement of the liver, we may be justified in assuming that there must have been a previous condition of the liver which prevented its enlargement. This may occur in a previously existing cirrhosis or fibrous perihepatitis.

In contrast to the passive hyperemia is the active hyperemia of the liver, which is much more rare and causes pains in the epigastrium which are usually as marked in the right hypochondrium as elsewhere. This condition is found in diabetes, malaria, and sometimes in pernicious anemia, paroxysmal hemoglobinuria, and hemolytic icterus.

It is also evident that any acute or chronic inflammation of the liver may cause epigastric pain, especially when the process is most marked in the left lobe of the organ as occurs in

cirrhosis or lues of the liver, intrahepatic colongitis, acute or chronic abscess of the liver, suppurating gumma, ecchinococcus, and neoplasm of the liver.

Any condition producing a marked stasis of bile in the liver may cause tenderness by stretching of the capsule. Pain and tenderness are rare in this condition, but tenderness on palpation is common.

We must also consider hydrops and chronic empyema of the gallbladder and chronic cholecystitis with or without stone. In addition to the continuous pain found in these conditions, we also find transient pains, especially at midnight and after meals. The objective examination may show the characteristic findings on palpation, enlargement of the liver, occasionally *Riedel's* lobe, and tenderness over the incisura of the liver, especially when the patient is on his back or left side while the examining finger is hooked under the right costal arch at the height of inspiration. Chronic cholelithiasis may produce symptoms which are similar to hydrops or empyema of the gallbladder, and it will be difficult to differentiate these conditions, as they often co-exist. In cholelithiasis we find, in addition to the mild and constant pains, an occasional slight increase of the pain which may last only a few minutes, and which follows a meal, psychical emotion, or riding over a rough

road. In addition, we find dyspeptic complaints, especially a sensation of fullness after food, so that the patients loosen their clothing after meals, a condition which occurs in pericholecystitis with adhesions as well as in gallstones.

A constant, moderate epigastric pain must also attract our attention to the pancreas. Although the fully developed picture of pancreatic disease is characterized by the stormy onset already described, cysts, tumors and chronic pancreatitis may cause only a mild, constant pain in the early stages. The luetic type of pancreatitis is especially likely to produce such a mild degree of pain with occasional icterus of marked degree, often glycosuria, anexoria, and loss of weight.

Conditions which diminish the spaces in the vicinity of the stomach, such as tumors of the spleen, left kidney, or adrenal; cysts of the left adrenal, tumors of the glands, etc., may also cause the pain under discussion. If these tumors grow rapidly, they may also cause colicky epigastric pains. This may occur in acute leucemia or in a sudden increase in size of a cyst of the adrenals with pressure on the cœliac plexus. We must not forget that similar pains, or even those resembling the pains in duodenal or pyloric stenosis, may be produced by direct compression of these parts from without.

Among the supradiaphragmatic conditions which may produce these pains in the epigastrium are chronic pleurisy and chronic pneumothorax.

We must also remember that epigastric pains may be due to disease of the abdominal walls themselves. Not rarely, a traumatic affection or strain of a wall which is weak, as in chlorosis, or normal muscles which are overworked as in prolonged intense cough may be responsible for such pains, especially in the recti at their insertion. We find that the tenderness is limited to this insertion, and the pains are increased by voluntary, active tension of the abdominal musculature. Epigastric pains may also be observed in rapid loss or gain in weight. The rapid gain in fat may stretch or tear the root of the mesentery and thus cause pain.

A tabetic patient may complain of epigastric pains which are described as girdle-like only after close questioning. The same is true of any condition causing irritation of the posterior spinal roots, such as anatomical lesions of the vertebra and spinal canal. This is especially true in tumor or chronic meningitis. In the two latter conditions there is tenderness on percussion of the spinous processes of the vertebra as well as hyperesthesia and hyperalgesia of the skin over the segment from the seventh to the ninth thoracic segment. Parasthesia may also be present over this region. I wish to mention

that a constant or temporary sensation of oppression in the epigastrium or oppression distributed like a girdle, may occasionally occur in *Parkinson's* disease.

Lax abdominal walls with or without enteroptosis may lead to similar pains, and these may be increased after meals, without any direct relation between the quality of the food and severity of the pain. Epigastric pain may also occur in individuals with weak muscles and ligaments as well as in people who have been in the upright position for some time with resulting fatigue. The intervertebral spaces shrink after relaxation of the patient, and this decrease in the spaces may irritate the spinal roots.

The diaphragm may cause pains by contractions of either tonic or clonic nature. These pains will be bilateral and will correspond to the insertion of this muscle into the chest wall. The clonic cramps are seen in prolonged hiccough. They also occur in hysteria and last for several weeks, or the attacks may be of only short duration. These hysterical cases produce a loud inspiration with stopping of the chest expansion, followed by a passive relaxation. The tonic cramp of the diaphragm is less common. Intense asthmatic attacks of long duration may cause epigastric pains by such a tonic contraction of the diaphragm. It is also found

in tetany and tetanus, and it is especially in the latter that these girdle pains present the warning symptom of this fatal disease. In tetany, we must also consider that quite similar pains may be the result of a gastro- or pylorospasm produced by a vagatonia.

Epigastric pain is sometimes experienced when the stomach is empty. The pains, therefore, appear in the morning or late at night and disappear after intake of food. This condition may be a frequent symptom of a local or general neurosis, but may be considered in the physiological domain if not too severe. It appears physiologically if the general nervous system is very sensitive. On the other hand, this painful empty stomach may be symptomatic as in gastric ulcer where it is due either to continuous secretion of gastric juice, intermittent hypersecretion, or perigastric adhesions which are stretched when the stomach is contracted.

Old callous ulcers may harbor residues of food, and this may later produce irritation of the ulcer. There may be gastromyxorrhea in addition to the gastric ulcer. Here we find pains, sometimes very intense when the stomach is empty, and vomiting of 200 to 300 cc. of pure mucus, after which the patient feels entirely well. We observe pain when the stomach is empty in atrophic catarrh during an early stage of carcinoma of the stomach. Furthermore,

we must think of a reflex origin, as from parasites in the intestine and chronic nicotinism, especially if the patients smoke on an empty stomach. We also find these pains in chronic appendicitis and periappendicitis, even in the absence of continuous secretion of the stomach. Migraine attacks are often accompanied by gnawing pains of the empty stomach. Tuberculosis of the lungs may produce secondary dyspeptic complaints with pains during the time that the stomach is empty, but, as a rule, there is also pain after intake of food which is less marked than in gastric ulcer or hypersecretion.

## Pain in the Right Hypochondrium

### Colicky Pains in the Region of the Gallbladder and Right Hypochondrium

There are three conditions which at first attract our attention in the presence of colicky, periodical pain in the gallbladder region. These are hepatic colic, duodenal ulcer, and ulcer near the pylorus.

Liver colic will be characterized by the localization over the gallbladder; the pain comes out at the right costal arch, and the patient feels as though he could draw out the pain from this region. Chills are frequent in the beginning of the attack, and we not rarely see a later rise in temperature which may be of various durations. The pain may radiate to the right chest or behind the sternum, through the upper part of the abdomen at the level of the liver, towards the back, upwards to the right shoulder, or between the shoulder-blades, and rarely towards the thighs. The pains appear, as a rule, at the height of digestion, about three to five hours after the meal; therefore most commonly at about four or six in the afternoon or during the

night, with a preference for the time near midnight. The pains may appear shortly after meals in cases where there are adhesions with the stomach. Psychical emotion sometimes brings on an attack. The patient often complains of a sensation of marked fullness in the stomach during the attack, and he may say that he feels as though his stomach is coming out. He may often have gagging or biliary vomiting during an attack, but these have no effect on the pain. The patient avoids all appreciable motion of the diaphragm, as the pains are increased during deep inspiration, and may even stop the act. The pain is increased in most cases when the patient lies on his left side and may feel like a tearing in the liver. The patient cannot bear the weight of his clothes or a light touch of the fingers.

Objectively, we find tenderness in the region of the incisura, at least on deep inspiration, pressure against the liver during inspiration, and on bimanual palpation of the liver with one hand on the incisura and the other pressing against it from the lumbar region. There is hyperesthesia of the skin over the gallbladder region and posteriorly between the lower border of the right lung and posterior costal arch. The lowest part of the thorax and right hypochondrium will be tender on rapid, sharp percussion of these regions with the ulnar part of the

hand. Rigidity of the upper right rectus is also present. The skin reflex of the upper right abdomen is often absent. There may be acute swelling of the liver, perihepatic rub, and lagging of the right hypochondrium during inspiration. The gallbladder may be palpable as a more or less tensely distended, pear-shaped tumor in cholecystitis, as well as in empyema. Stones in the gallbladder may sometimes be palpated. Icterus is not common even when the process is of long duration, or after repeated attacks. Itching, either localized or general, may be present with or without icterus. On the contrary, urobilinogenuria and urobilinuria are of diagnostic value. The febrile attack may be accompanied by splenic enlargement or even herpes. Not uncommonly, the patient complains of increased pains which last several hours after palpation of the gallbladder, just as it occurs in the cecal region in appendicitis. Bradycardia is a symptom of importance.

The onset of the attack may be sudden or rather gradual, with a rapid increase in severity to its acme. The course and severity may last without any appreciable fluctuation for a few minutes, hours, or days, to end abruptly in some cases and rather gradually in others. Such attacks recur at irregular intervals of a few days or weeks and reappear after a period of quiescence lasting weeks, months, or years. This

general outline corresponds to one type of liver colic as is seen in cholecystitis due to gallstones or thickened bile. It is the most frequent type of liver colic seen.

The symptoms of gallstones depend on the location of the calculus. Intense pains lasting several days are peculiar to gallstones in the gallbladder or cystic duct. This condition will further be characterized by mild fever lasting several days, although this fever may be absent. Leucocytosis is present even after disappearance of the pain or fever. The presence of a large, tender gallbladder, hypocholia of the stools and absence of icterus are seen in cholecystitis or stones in the gallbladder. Icterus and hypocholia of the stools occur in these cases if the common or hepatic ducts are involved either in inflammation, such as occurs in chronic cases, with infection or compression from without. If the stone reaches the common duct, we will find a very sudden, single, intense, short, colicky pain around the navel, with an intense or even total obstruction icterus as early signs. A temporary high fever of short duration with initial chills may also be present.

If the stone remains in the common duct, the effect may be variable as follows. First, the clinical manifestations may consist of moderate pains localized to the region of the gallbladder, epigastrium, around the navel, or even to the

left of the midline. Chills and a short, high fever may also be present. Distinct icterus and acholia or hypocholia of the stools are usually present and may regress but very slowly. Itching is, as a rule, very marked; the gallbladder is usually small, shrunken, and not palpable. High leucocytosis and tumor of the spleen may also be found. The former may be present only during an attack and disappear in the intervals. Such attacks recur at irregular intervals, often following each other so quickly that the icterus has no time to regress.

Second, the stone constantly hinders the outflow of bile, causing chronic icterus and marked and obstinate itching of the skin. These may develop without the appearance of pains.

Third, the most common type shows a single, very severe attack of colic with icterus, chills, and fever and is followed at irregular intervals by similar attacks, which are always less severe in degree. Finally, the icterus and pains are entirely absent, the former being replaced by a peculiar ashy color of the skin, and the diagnosis will then be based upon the reappearing chill and fever attacks, the enlargement of the liver which is nearly always present, urobilinuria, and itching of the skin, which is usually a constant finding in chronic gallstone disease of the common duct.

The chronic cholelithiasis, which is followed

by hydrops or empyema of the gallbladder, will be discussed in the chapter dealing with chronic hypochondrial pain in the right side.

I wish to call attention to the fact that many cases of stone in the hepatic, cystic and common ducts cause enlargement of the liver without any other symptoms. Such a type can be diagnosed only after repeated examination and the finding of this periodic swelling of the liver.

We usually have to deal with a combination of cholecystitis and cholelithiasis when the clinical picture is typical. We may use the following points to determine whether we are dealing with aseptic stones in the gallbladder or cholecystitis. In cholecystitis with stone there are fever, the usual findings on palpation, feeling of soreness or mild pain over the gallbladder during the intervals between the acute attacks, and a painful catch in the breath during inspiration. The passage of stones in the feces or the positive findings on X-ray examination may be decisive.

In acute cholecystitis or cholangitis without stone, we may find exactly the same type of liver colic. This group includes the cholecystitis caused by typhoid, paratyphoid, colon bacillus group, or pus-producing bacteria, as in osteomyelitis, by carcinoma or tuberculosis of the gallbladder, and acute syphilitic cholecystitis with high fever. The diagnosis of the serous or

seropurulent cholecystitis will be made on the above-mentioned symptoms of liver colic, but the gallbladder is seldom palpable, as it is covered by the liver or is shrunken. There may also be urobilinuria and nucleoalbuminuria. Typhoid cholecystitis will also produce a leucopenia. The signs of inflammation will be more marked if the disease becomes purulent, and this will be manifested by increase of the pain and tenderness.

In cases of very severe or phlegmonous cholecystitis, the patient may show the picture of a localized or very severe peritonitis. The colicky pains, however, need not be very intense and may sometimes be found in the epigastric or in the ileocecal region. The tenderness may be diffuse, later becoming localized over the gallbladder region, and the gallbladder itself may be palpable. It is evident that the history will be of great value in many cases of this group.

In typhoid or paratyphoid, the cholecystitis may appear during the disease or after a long interval even after a lapse of several years. A chronically inflamed gallbladder, may, on the contrary, be a portal of entry for typhoid bacilli and thus facilitate a chronic typhoid infection which may later break out into a typical attack of typhoid. It seems advisable, therefore, in cases of indefinite infection of the gallbladder

or ducts, especially if the attacks are accompanied by diarrhea, to examine the feces for typhoid or paratyphoid bacilli and to make a blood examination, *Diazo* reaction and white cell count.

The distention of the whole abdomen, which may occur in liver colic, especially when due to gallstones or acute cholecystitis, is apparently due to a reflex paralysis of the bowel or a paralysis situated above a spastic contraction. Passage of feces and flatus may be absent for many hours in some cases, and there may be distinct symptoms of ileus in some very severe cases. It is worth mentioning that these signs of distention may precede the attack of liver colic by several hours. It is possible that this occurs in those with a special predisposition of the intestines, as in a case I have seen of chronic abuse of tobacco extending for several years.

The acute cholangitis, either intra- or extrahepatic, will be diagnosed by the presence of moderate pains even after the attack of colic has gone, as well as by the presence of a perihepatic rub, considerable swelling of the liver, exquisite and continuous tenderness over the incisura hepatis, icterus of variable intensity with hypocholia (acholia is only rarely observed), polynuclear leucocytosis, and acute tumor of the spleen. The splenic enlargement is a common finding in these cases. Of course, we

must not be satisfied with the mere diagnosis of cholangitis, but we should try to determine the underlying cause. It may be secondary to an acute cholecystitis, to hematogenous or lymphatic infection from the intestines, and occasionally to foreign bodies or parasites in the bowel. Ulcer and carcinoma of the duodenum at or near the region of the papilla are also possible causes.

Infectious, inflammatory conditions may cause liver colic, and the picture may resemble gallstone colic with many recurrences. If we are dealing with a single attack of colic with persisting symptoms, such as icterus, we will consider the condition as secondary rather than as primary cholangitis. We will also have to think of the possibility of a carcinoma of the gallbladder or cystic duct if we are dealing with an older person who has an attack of colic for the first time or an attack after many years of apparent dormancy; especially if the icterus appears several weeks after the colic and there is anorexia and ascites.

In the presence of a cholangitis, we must consider a stone in the common duct or stenosis of the latter from some other cause, such as carcinoma of the duodenum at the diverticulum or in the head of the pancreas, carcinoma of the common or hepatic ducts, and gumma or tuberculosis of the gallbladder.

Another cause for recurring liver colic is the presence of adhesions around the gallbladder or liver with the omentum, stomach, duodenum, colon, or abdominal walls. These adhesions are usually acquired, although they may exceptionally be congenital. They probably cause liver colics by torsions or displacements which cause periodic difficulty in the outflow of the bile into the intestine. High fever or evident obstruction icterus will point against this diagnosis, but slight icterus or mild temperature may be present. The diagnosis will be based on the history of a causative factor, the influence of posture on the pains, and the dependence of the pains on the fullness of the gastrointestinal tract or its peristaltic activity. These latter factors explain the relation to the intake of food: In cases of dilatation of the stomach or duodenum; the presence of an enlarged gallbladder will point to a compression of the latter; the absence of an enlarged gallbladder will speak for adhesions. X-ray may also be of value in the diagnosis of this condition. It is evident that the presence of adhesions between the under surface of the liver, especially of the left lobe or of the gallbladder to the stomach, will modify the radiation of the pains in diseases of the stomach. The radiation of pain to the right in cases of known or recognized gastric

ulcer will point to the presence of such adhesions.

The *Wassermann* reaction and the effect of luetic treatment will be of great importance in liver colic of luetic origin which is due to adhesions or to a lues of the liver followed by a secondary cholangitis.

We must not forget that the liver colics which are due to adhesions may sometimes be signs of early malignant disease. Another possible cause for such a liver colic is echinococcus cyst of the liver which has perforated into the large bile ducts with a wandering of the daughter cysts in the bile passages. The diagnosis will be based on the history, cystic tumor in the liver, characteristic fremitus over the cyst, presence of hooklets or membranes of the cyst in the stools, eosinophilia, urticaria with the liver colic, and the specific complement fixation test.

A perforation of a tuberculous gland, more rarely of a carcinomatous gland ad portam hepatis into the larger extrahepatic gall ducts, may produce such an intense colicky attack. Of course, we can make the diagnosis only when the existence of such glands is known to have been present and when these glands produce an obstruction icterus which slowly increases in intensity, regresses rapidly with a severe colic, and is then accompanied by the reappearance of cholic feces and acute malena.

Liver colic may be due to a real mechanical obstruction as well as to the infectious causes mentioned before. Such mechanical obstructions may be congenital or acquired. The latter occurs after operations on the bile passages, as a result of ulcerative cholangitis (typhoid, coli, tuberculosis and lues) and stones with subsequent scar formation. Other causes are malignant tumors or papillomata of the hepatic or common ducts or duodenum, carcinoma of the head of the pancreas, rarely pyloric carcinoma, chronic pancreatitis, enlargement of the periportal and retroperitoneal glands, luetic or tuberculous foci healed by masses of connective tissue, chronic luetic peritonitis, compression by tumors or cysts of the liver, abnormally large gallbladder or right kidney, large transverse colon, and foreign bodies, such as fruit seeds and parasites.

I wish to emphasize the point that chronic affections must also be considered if a patient who has previously been in excellent health suddenly develops a classical liver colic. Such colics may recur in some cases and are followed after some time by chronic obstruction icterus while the pain regresses or even entirely disappears.

There are two conditions which may produce liver colic but which cannot be differentiated from one another. These are aneurism of the vessels of the gallbladder and the same affection of the arteries of the liver. We find a

pulsating tumor, systolic or continuous murmur over this tumor, obstruction icterus, and history of trauma or infectious disease which may cause this condition. Aneurism of a gallbladder artery may also produce a sudden bleeding from the mouth or rectum. The colicky pains will be due, not so much to the tumor itself, but rather to the repeated bleedings in the bile ducts. Similar bleedings causing liver colic may be present in angioma of the liver or hemorrhages into luetic liver tissues.

Cases of parasitic obstruction of the bile ducts will show eosinophilia, eggs in the feces, chronic jaundice or icterus of varying intensity, cholecystitis, or cholangitis with enlargement of the liver and with, perhaps, eventual clearing up of the symptoms after passage of the parasites either per mouth or rectum.

An abnormally movable or pedicled gallbladder may also lead to liver colic.

We must distinguish a group of the so-called pseudoliver colics from the true liver colic. The former group includes those cases caused by stretching or inflammation of the capsule of the liver, or of primary inflammation of the capsule. The diagnosis will be simplified by hearing a perihepatic rub, but we may make the diagnosis even in the absence of this rub by noting that the pains appear or are increased by movement of the diaphragm, as in coughing,

breathing, or sneezing. These pains are sometimes described by the patients as a stitch in the side. Furthermore, there is marked tenderness in the intercostal spaces, lagging of the right lower chest during respiration, and a catch of the right upper rectus in inspiration. The diagnosis may be more difficult if fever is present, as *Pick's* polyserositis may begin with fever and liver colic of this nature.

Still more difficult will be the diagnosis of conditions causing but a single attack of liver colic with collapse. Here we must remember that acute perforative peritonitis in the region of the porta hepatis resulting from a perforated gastric ulcer may produce such an attack by the rapidly developing perihepatitis.

Another cause of pseudohepatic colic with fever of an intermittent character and short course is acute purulent or luetic pylephlibitis of the portal vein, which may be caused by inflammation somewhere in the abdomen or infectious process in the bile passages or gallbladder, or in gallstones.

We must, furthermore, mention thrombosis of the portal vein or of a vein in a loop of small intestine. Thrombosis of the portal vein will cause a rapidly developing ascites with acute splenic enlargement and the usual signs of portal stasis, such as dilatation of the veins in the abdominal walls and varices in the œsophagus,

rectum, etc. Thrombosis of a mesenteric vein, in which a local tenderness in the gallbladder region may be present, will be diagnosed by an occult or manifest malena, history of a trauma to the abdomen, a demonstrable inflammation or ulceration in the small intestine, and conditions in the heart, liver, or portal vein, which may interfere with the circulation in the portal veins.

Acute yellow atrophy may, in a small number of cases, cause very intense liver colic, which may be repeated several times daily. The same symptom has also been described in phosphorus poisoning. The diagnosis of the acute yellow atrophy will not be easy even in pregnant or puerperal women, as it is just these patients who are disposed to gallstone attacks. The subacute type of acute yellow atrophy will be more difficult to recognize, as severe symptoms such as the marked nervous, toxic symptoms, marked weakness, apathy, delirium, etc., may be absent. Only general weakness or dyspepsia may be complained of for weeks. In addition we sometimes find an initial enlargement of the liver which is in contrast to the later shrinkage. Fever is often present, the spleen is nearly always enlarged, and there is intense icterus with absence of hypocholia or acholia in the early stages, as the resulting icterus in the early stages is not a result of obstruction in the bile passages.

A symptom which to me seems very important is the repeated vomiting of large amounts of bile. This symptom is of value only if we can exclude a communication between the stomach and gall-bladder or bile ducts. We must search for leucin and tyrosin in the urine, diminution of urea, and increase in ammonia and bilirubin, the latter sometimes being seen in crystals. In the further course, the progressive shrinkage of the liver, severe nervous symptoms, and signs of a severe hemorrhagic diathesis will appear.

Suppuration of the liver itself, either as a primary solitary or multiple abscess, suppurating carcinoma or gumma, echinococcus cyst or angiamo, or the result of ascaris infection all produce febrile liver colics. In such suppurative conditions, we will find local tenderness, enlargement of the liver as a whole, but with increase in size at some particular place, tumor of the spleen, moderate leucocytosis, and, occasionally, icterus. The cause of the suppuration may be determined by serological or X-ray examination as well as by the symptoms which are rather characteristic in these cases.

Liver colics in syphilis of the liver may not only be caused by the complicating cholangitis, cholecystitis, or perihepatitis and suppuration of a gumma, but may be due to the interstitial luetic hepatitis, even in the absence of suppuration. It is important to notice that the enlarge-

ment of the liver is especially marked in the left lobe, or a part of the liver near the gall-bladder may become enlarged, as sometimes occurs in gallbladder disease. The consistency is increased, the surface is smooth or knobby, the spleen is usually enlarged, and there are intermittent and irregular fever and albuminuria. The pains in interstitial hepatitis may be due to the accompanying perihepatitis or to rupture of a syphilitic vessel of the liver with the resulting bleeding into a bile duct, as occurs in infarct of the liver. Acute malena will be present in bleeding into a bile duct and in infarct of the liver.

In cases of carcinoma of the liver, colicky pains may be due, as already mentioned, to suppuration of the carcinomatous nodule, secondary perihepatitis, or an increased tension of the capsule if the growth of the tumor is very rapid.

A wandering liver may also be accompanied by intense, colicky pains in the right hypochondrium, especially upon quick or sudden movements of the body. The diagnosis will be made on the abnormally deep position of the liver, especially the upper and posterior borders, and on the abnormal mobility of the organ.

Hemolytic icterus may also be accompanied by colicky or pressing pains which recur and are usually mild, although they may be severe

and located in the region of the liver incisura or over the whole liver region. As a rule, we find at the same time colicky pains in the left hypochondrium which may even be more marked than those in the right hypochondrium. The liver and spleen are enlarged, the anemia and the icterus may vary in intensity from time to time, and bilirubin may be absent, or present only in traces in the urine, while urobilin and urobilinogen may be very marked. The blood serum shows a more or less marked bilirubin reaction. There is hypercholia of the feces and often diarrhea. Bradycardia and itching are usually absent. Very characteristic is the rapid and striking reduction in the number of erythrocytes during the attacks, which may also be accompanied by the clinical signs of acute anemia, such as weakness, faintness, and cerebral irritation. We will also have to examine the reaction of the red blood cells with hypotonic salt solution and also of autoagglutination. The history of the same illness in the family is of value. The painful attacks may closely resemble real gallstone colic and are due to the thickened bile or concretions. In other cases, the abnormally large destruction of red blood cells may cause the pains. The pains may persist or even increase after extirpation of the spleen, so that we are forced to believe that this is an affection of the entire hemolytic system, among

which the star cells of *Kupfer* may be considered.

If we observe a case of liver colic without any objective findings, we should hesitate to make the diagnosis of hepatic neuralgia, as all these cases which have come to my attention have eventually turned out to be due to gallstones. More important are those cases described as liver crises of tabes. These attacks are sometimes accompanied by a slight attack of icterus and are perhaps explained by a cramp of the muscle of the bile ducts. Another nervous condition which must be considered is abdominal migraine, in which the attacks may sometimes resemble a real gallstone colic, but in which a family history will be of importance. The occurrence of typical migraine in the head, alternating with such attacks as here mentioned, may be seen. Besides the absence of all local and general findings and the presence of normal urine, I think that it is of importance to remember that migraine ends, as a rule, with vomiting, a phenomenon which does not occur in gallstone colic in which the vomiting has little or no effect on the pain. Deep inspiration, which increases the pain in gallstone disease, will not have any influence in these cases. The effect of migraine treatment may be of some help in these cases.

So far we have discussed pseudoliver colic due to conditions of the liver itself, but we shall

now consider those cases due to extrahepatic conditions. In the first place, we must mention duodenal ulcer, especially cases which cause periodic attacks. Icterus may be present and may be due to an intercurrent affection of the gall ducts or stenosis of the papilla of *Vater* by a callous ulcer. Colicky pains in the liver region may also be due to a stenosis of the duodenum following healing of an ulcer in this region. The same may be true in gastric ulcer, pyloric stenosis from some other cause or adhesions, especially acute perigastritis following an ulcer of the stomach or duodenum. Acute lymphadenitis at the porta hepatis from these peptic ulcers may also cause liver colic.

Diaphragmatic pains on the right side may be due to a primary diaphragmitis or may be secondary to a basal pneumonia. This may be accompanied by a slight degree of icterus and urobilin and bilirubin in the urine. The presence of the tender points along the phrenic nerve and the absence of tenderness over the liver will distinguish this form of pain from hepatic colic. The same may be true of a basal pneumonia of either side, but we must also remember that a disease below the diaphragm may also cause a pneumonia by extension along the various routes.

It may be important to mention that the first symptom of carcinoma at the pylorus may be

such a pseudohepatic colic which may sometimes appear at night and recur periodically for weeks before any symptom referable to the stomach appears.

We must bear in mind, in all cases of hypochondrial pain on either side, the possibility of a retroperitoneal condition such as retroperitoneal sarcoma.

The clinical picture of a liver colic may also be imitated by disease of the pancreas, such as acute or chronic pancreatitis, pancreas necrosis, stone, or, more rarely, pancreatic cysts. In all these cases the functional tests will be of very great importance, but we must also remember that a complicating pancreatitis may occur in cholecystitis or real gallstone disease, so that alimentary glycosuria in gallbladder or gallstone disease must call our attention to the possibility of this condition.

The colon may simulate hepatic colic in cases of ulcer at the hepatic flexure, as may simple intestinal colics due to fecal masses in the colon, carcinoma of the hepatic flexure, especially if adherent to the gallbladder, and carcinoma anywhere in the colon distal to the hepatic flexure, in which condition the pain is caused by distention by the accumulated gases which are unable to pass the obstruction.

Other conditions which may cause such symptoms are colitis and pericolitis, especially the

latter if localized at the hepatic flexure, or if the pericolitic exudate extends toward the liver. Icterus, acute splenic tumor, and herpes may be present in pericolitis, but the diagnosis may be made on careful palpation after the acute symptoms have disappeared. At this time we may find a fixed, sausage-shaped tumor extending from the costal arch to the iliac fossæ, which may produce borborygmi during palpation, especially if the condition is regressing. Furthermore, the history of a previous intestinal affection, to a certain extent the presence of indican in the urine, and the absence of hepatic enlargement all speak for pericolitis or colitis of the ascending colon.

For the assumption of adhesions, it seems to me of importance that the very severe colicky pains appear five to six hours after meals, often also during the night, and sometimes upon bodily motion. The finding of local tenderness over the colon is of importance. We must remember the peculiar qualities of a colonic colic. These are the wave-like character, short duration of the waves, which are a few minutes long at the most, gurgling in the abdomen, termination of the colic on passage of flatus or feces, and the fact that the colic may be provoked by a gas-producing diet. Chills and fever are, as a rule, absent unless there are ulcerations of the colon, as from a carcinoma, but even in

these cases the fever is not connected with the attack of colic, but is also present during the intervals. The pains in disease of the colon may also travel from place to place along the colon and may be relieved by local pressure or massage. I also wish to emphasize the great value of the X-rays in the diagnosis of most of the diseases of the colon which have been discussed.

The acute appendicitis and periappendicitis need special discussion. Icterus may be present in a certain number of these cases, both severe and mild. This icterus may be due to sepsis, toxic affection, or purulent infection of the liver, accompanying purulent cholangitis or, perhaps, intestinal paresis with consequent hindrance to the outflow of bile. The icterus in simple appendicitis may be due to toxic sepsis and may be a sign of necrosis of the appendix. The icterus may in expectional cases be in the nature of a primary catarrhal jaundice with secondary affection of the appendix.

The pains in appendicitis may occasionally be localized under the right costal arch, more commonly midway between the gallbladder and ileocecal region, and may radiate upwards to the right. We must remember that the appendix may be turned upwards or may be displaced upwards in pregnant women or as a sort of congenital anomaly. The latter condition is

caused by a failure of the appendix to descend from its embryonal location under the liver. It is evident that in such conditions one may easily make an incorrect diagnosis, since chills, fever, vomiting, and even icterus may be present. The latter may be due to a compression of the large bile ducts by the exudate. This congenital anomaly may be suspected when we observe a sinking in of the abdomen over the normal cecal region, but is ruled out if we can palpate the cecum in its normal place. A tympanitic area between the lower border of the liver and the tumor mass speaks for a periappendicitis.

In some cases of an enlarged gallbladder, tympany may be found between the liver and tumor if the colon is interposed between them. I have seen cases in which this phenomenon was constantly present and was due to fixation of the colon by adhesions in the above-described position. In addition to the shape of the tumor, the sequence of the appearance of symptoms will be of value. In involvement of the appendix, the pain is the initial symptom and is soon followed by vomiting and fever. In cholecystitis, however, the vomiting occurs late if at all. The rectal examination will be of particular importance in these cases, the rigidity of the rectus muscle will not be so much restricted to the upper portion as in gallbladder disease, while the abdominal reflexes of the middle and

lower parts are absent. Pronounced and constant indicanuria is rarely present in disease of the gallbladder, while it is quite a constant finding in appendical affection. Enlargement of the liver should be used only with caution as a diagnostic sign.

High retrocecal appendicitis may also imitate acute gallbladder disease by producing a severe colicky attack with vomiting and fever of varying intensity, and with the pains in the anterior and posterior liver regions. Deep inspirations increase these pains; there are slight traces of icterus and some albumin in the urine, and symptoms of acute nephritis may follow. The patient also has exquisite tenderness in the region of the incisura of the liver, with hyperesthesia of the skin in this region, lagging or absence of respiratory movement of the right lower chest, polynuclear leucocytosis, and signs of a general sepsis. The rigidity is, as a rule, in the entire right rectus muscle but may be less marked in the lower part. All the abdominal reflexes of the right side are absent, but, rectally, we will always find a tender point corresponding to the appendix. Dysuria may also be present. The condition seems to be more frequent in men than in women. A similar picture may be found in actinomycosis of the appendix, followed by spread into the liver.

Another complication of a primary appendi-

citis which may be confused with gallbladder disease is an involvement of the portal vein. Thrombophlebitis of the mesenteric vein or of the retrocecal veins which go to the vena cava may also give rise to symptoms which may be mistaken for gallbladder disease. The involvement of the portal vein is not a rare complication and may lead to liver abscess. We may suspect portal vein disease if we observe that tenderness in the liver occurs about twenty-four hours or later after the appendical attack.

We sometimes find, after purulent appendicitis or operation for this condition, the development of icterus which is due to acute parenchymatous hepatitis, and which is followed by acute yellow atrophy of the liver, a condition which is caused by sepsis of the liver or perhaps the effect of chloroform on the liver.

In regard to the differentiation between a primary pericholecystitis and periappendicitis, which may be a result of the first, I wish to refer the reader to a chapter dealing with these conditions.

Another condition in which the patient may complain of very severe colicky or more continuous, throbbing, or boring pains in the gallbladder region is in perforation of the gallbladder into the colon, stomach, or duodenum, and more rarely of these organs into the gallbladder. The cause of this perforation is usually

a necrosis caused by a gallstone or carcinoma. This kind of perforation may be made possible by adhesions or by local peritonitis between these organs. The diagnosis will be based on the pains and fever, local tenderness, local peritonitic symptoms, general septic appearance, the appearance of diarrhea with bile or even pus after a preceding acholic stool, gross bleeding or malena in the stools, and abrupt regression of the infectious symptoms. Tenesmus may also be present in perforation into the colon.

Organs distant from the colon may produce colics which may be mistaken for primary liver colics. A wandering kidney, for instance, may be located near the porta hepatis and produce a compression of the common duct of the liver with resulting colic and even icterus. In such cases, the tumor of the kidney may be mistaken for the gallbladder, especially in cases of intermittent hydronephrosis where the kidney is adherent to the liver. The true nature of the condition will be recognized if the pain disappears after reposition of the tumor in the renal region; the normal kidney dullness in the renal region may be absent, the colics will not be nocturnal, as they are in gallstones, and there may be albuminuria or red cells in the urine after palpation of the tumor. In cases where the usual physical methods are not sufficient, we

may employ the X-ray with a metal urethral catheter in place or after filling the pelvis with collargol or potassium iodide solution. We must not forget that a combination of wandering kidney or nephroptosis and cholelithiasis is not at all uncommon.

A genuine gallstone colic with all its typical symptoms may be mistaken for a renal colic when the kidney is in an abnormally high position. I have seen cases in females only where the patients were suffering from gallstone colic but also had a constant desire to urinate without being able to do so. The pains may even radiate along the ureters into the bladder or labia. This condition is recognized by the fact that pain on deep percussion over the kidney region is less marked than over the liver region anteriorly, and by the presence of the other usual symptoms of gallstone disease.

Not only a displaced right kidney, but one in its normal position may produce pains which are located in the gallbladder region. Here, the pain and tenderness are located deeply rather than immediately behind the right costal arch. We also have the usual physical and urinary findings associated with renal disease. In cases of combined gallstone and renal disease, the patient may experience the attack of subsequent and, later, renal colic after a gallstone colic has already set in.

Another possible combination of gallstone and renal colic may be seen in perforation of a gallstone into the kidney pelvis, especially if there was a pre-existing pericholecystitis. It may be possible to find that a gallstone has passed along the urinary tract.

I wish to point out particularly that an affection of the right kidney may be associated with sudden colic or more or less continuous pain in the gallbladder region. These are cases of inflammation or even suppuration of the fatty kidney capsule, not involving the posterior surface, but affecting only the anterior and surrounding tissues. In all the cases that I have seen, the patients complained of pain in the gallbladder region, the pains and tenderness being very deep and not directly behind the arch; the skin in the lumbar region was hyperalgesic, and there was a tenderness on deep percussion over these regions. There was absence of hepatic findings, and there were no red cells, bacteria, or albumin in the urine. A history of some previous suppuration as furunculosis, etc., will be of importance.

Finally, I wish to mention that hypochondrial pains on the right side may be produced by tumors, especially by hypernephroma of the anterior surface of the kidney.

We must also bear in mind the possibility of the female genitalia as causing pains similar

to liver colic. These are ovarian tumors or long pedicled tumors of the uterus, such as long subserous myomata and especially the extra-uterine pregnancies. The difficulties in these cases are very great, as we know that the first attack of cholelithiasis often appears during the first pregnancy.

Pseudoliver colic and even icterus may be present in cases of chronic lead poisoning, especially in those cases in which there was previous disease of the gallbladder. These attacks of apparent liver colic in lead poisoning may be due to atypical localization of the pains or to the blood destruction, namely, hemolysis, just as in cases of hemolytic icterus.

In conclusion, I wish again to emphasize the point that recurring colics in a cholelithiasis need not always be due to recurring gallstone trouble, but may be due to some other cause, as adhesions, perforations, etc.

### Acute, Continuous Pain in the Right Hypochondrium, Over the Gallbladder Region

Not all the diseases of the bile ducts and gallbladder cause colicky pains, as they may also be boring, burning, and throbbing in character, or they may be described as a painful tension in the gallbladder region. The pains appear suddenly and remain as a continuous type for the remainder of the attack. This occurs

especially in acute inflammation of the gallbladder or of its peritoneal covering. All the conditions which have been mentioned as producing liver colic may produce continuous pain instead of colic. I wish to point out one condition of the gallbladder—the rare torsion of this organ which is characterized by a suddenly beginning, intense pain in the gallbladder, local tenderness, constipation, leucocytosis, sometimes vomiting, and the formation of a palpable tumor in the gallbladder region. This tumor may be pear-shaped, or, if the gallbladder lies rather transversely, it may be kidney-shaped and may then be mistaken for a wandering kidney or hydronephrosis.

Rupture of the gallbladder is more common after it has undergone inflammation. It then ruptures in a previously walled-off sac in most cases. In this condition we may obtain a history of previous attacks of pain in the gallbladder region, with a sudden increase in intensity, with fever, and sometimes with an initial chill and collapse. The local abdominal rigidity, pain, and tenderness will be very marked. Later, there is a palpable tumor which is also painful, is seen in the gallbladder region, and corresponds to the pericholecystitic abscess. The fever will continue, chills and peritonitic symptoms will perhaps appear, and the pulse will be markedly slow as a result of absorption of bile.

The perforation into the free peritoneal cavity is, as a rule, characterized by wandering of the pains towards the navel after a few hours and collection of the exudate in the ileocecal region. The condition may then be mistaken for acute appendicitis.

We must furthermore consider acute pylephlebitis of the portal vein, acute thrombosis of this vein, and ascending thrombosis of the hepatic veins resulting from a thrombosis of a mesenteric vein. In acute portal thrombosis we will find very sudden and intense pains, sometimes diffuse and sometimes localized over the liver region, vomiting, bloody diarrhea, acute meteorism, acute tumor of the spleen, and strikingly rapid development of ascites which quickly reappears after puncture. Icterus and urobilinuria are absent as a rule, but the absence of this urobilinuria may be used in excluding this vein affection as arising from a liver or gallbladder disease. In cases where there is only inflammation of the vein and no obstruction, we find intermittent fever, chills, local tenderness ad portam hepatis, general sepsis, and leucocytosis or leucopenia. These findings will make us think of this condition in the presence of a causative factor.

In addition to thrombosis of the portal vein, we must also remember that sudden, intense pain in the liver region may be caused by throm-

bosis of the hepatic veins or the vena cava inferior below the diaphragm. Hepatic vein thrombosis will be characterized by a marked passive hyperemia of the liver and its enlargement with signs of portal stasis. Thrombosis of the vena cava will show the same symptoms with the addition of edema in the lower extremities and lower part of the body.

In the presence of an endocarditis, we must think of the rare possibility of an embolus in the hepatic artery or one of its branches, which may be followed by infarct or perihepatitis.

Actinomycosis of the liver presents a picture of sepsis apparently arising from the liver, but the course is not stormy.

A wandering liver may also be the cause of such pains, and the pains may be due to the interposition of the colon between the liver and the diaphragm. This condition is characterized by a zone of tympany over the liver dullness and by abnormal location of the colon as shown by X-ray examination.

Among the gastric and duodenal conditions which cause this pain are rupture of the duodenum, perigastritis, periduodenitis, and periappendicitis. In cases of acute periduodenitis, we have two valuable indications: the patient complains of pain in the back at the level of the lesion, with hyperesthesia of the skin over this posterior area, and there is shortening of the

distance between the tip of the tenth rib and the spine of the ilium. Perigastritis, periappendicitis, and abscess around the duodenum will present great difficulties in the absence of a history of disease in these regions.

We must add that such pains may also be caused by disease of the pancreas, tumors behind the liver, disease of the transverse colon, distention by gas of the hepatic flexure, which may be a result of general flatulence or moderate stenosis, disease of the periportal glands, wandering kidney which is fixed at the porta hepatis, and such renal affections as pyelitis and renal infarct. In the renal infarct, the pains may be accompanied by chills and vomiting, and the liver may be tender as a result of a weak heart. In these cases, the tenderness of the liver may lead to difficulties in the diagnosis.

Apoplexy into the perirenal tissues must also be mentioned as a cause for this type of pain. The symptoms are very much like those of gallbladder disease, as there may also be intense initial pain with collapse and an indistinct tumor in the right hypochondrium corresponding to the perirenal hematoma. The right hypochondrium may be tender and bulging. The liver is pushed forward and appears enlarged as a result of this displacement. Icterus may be present and is hematohepatogenous and not obstructive in origin.

The cardiac conditions which may cause this pain are atypically located angina pectoris and rupture of the right auricle.

We must also mention two infectious diseases which may imitate liver colic. These are malaria and recurrent fever. Pain in the gallbladder region with tenderness, hyperesthesia of the skin over the liver and in the back, and moderate enlargement of the liver may be seen in malaria. The finding of the parasite in the blood and the effect of quinine may give the proper clue.

### Chronic Continuous Hypochondrialgia Dextra in the Gallbladder Region

Any of the diseases of the liver, bile ducts, and organs in the immediate vicinity of the liver may cause this type of pain if the course as a whole is mild. A common cause of this type of pain is hydrops of the gallbladder—a condition which may also exist without pain. Of value in the differentiation from empyema or cholecystitis are the absence of marked tenderness, fever, increased pulse rate, and leucocytosis. The cause of the hydrops may be stone or carcinoma of the common duct. If a patient who never previously suffered from liver colic shows a hydrops of the gallbladder in the later course of life, we must suspect an incipient carcinoma.

On the contrary, a history of repeated colicky

attacks will call attention to the possibility of a stone in the bile ducts. The general symptoms, such as dyspeptic complaints, anorexia, cachexia, progressive course, and icterus with ascites, will point to carcinoma. More common than hydrops as a cause for such pains are pericholecystitic adhesions. Here we find that the pains are often increased by intake of food, movement of the bowels, lifting of heavy weights, or brisk movement of the body. The patients are sometimes compelled to assume certain attitudes in order to obtain relief. We occasionally find that the pains are increased upon raising the right arm, a phenomenon which is due to adhesion of the right diaphragm with the abdominal wall.

### Diffuse Pain Over the Right Hypochondrium

If a patient complains of pains which last for various periods of time and which are not localized to the gallbladder region, but are also diffuse over the right hypochondrium, we must first consider all the affections which may cause enlargement of the liver with resulting stretching of the capsule. The pain results from the stretching of the nerves, which are present in great numbers in the capsule. Diabetes may cause active hyperemia of the liver with consequent stretching of the capsule nerves.

Another cause may be non-suppurative, parenchymatous hepatitis from infectious or toxic con-

ditions, sometimes combined with very intense pains, fever sweats, leucocytosis, and dyspeptic complaints. Gout, either before or during an attack, may cause swelling of the liver with urobilinuria. Polycythemia rubra and hemolytic icterus may also cause this pain. The pain may be due to the thickened bile obstructing the bile ducts in hemolytic icterus. In alcoholic cirrhosis, the pain is due partly to the regeneration and partly to the cholangitis. We must also consider passive hyperemia of the liver, all chronic inflammatory or neoplastic processes, echinococcus, perihepatitis, which may be an early sign of a tuberculous peritonitis still localized, chronic intrahepatic pylephlebitis, and subphrenic inflammation on suppuration. In regard to the latter condition, I wish to emphasize the point that it may be the only symptom of a chronic appendicitis for a long time. The autopsy in these cases need not necessarily show the presence of small hepatic abscesses, as we may find only a round cell infiltration around the intrahepatic tributaries of the portal veins. In this connection, we must remember that an actinomycosis may be the cause of a chronic appendicitis.

Furthermore, we must mention stenosing or obstructing processes of the large bile ducts and also hypertrophic cirrhosis or simple catarrhal icterus. The liver is more tender on percussion

in the midline than elsewhere, as it is exposed more in this region than anywhere else.

Passive hyperemia of the liver may cause pain or oppression in the epigastrium, and these may be the first and only signs of cardiac insufficiency in acute or chronic heart disease. This may be seen in diphtheritic myocarditis in which the epigastric distress may be the only symptom of the acute infectious myocarditis. Intermittent exacerbations of this chronic epigastric pain may be due to intrahepatic thrombosis. Passive hyperemia of the liver may also be present as a result of abdominal plethora with or without adiposity and where there is no weakened heart. In some of these cases, the abdominal plethora may be due to beginning sclerosis of the splanchnic arteries, in other cases to lack of activity of the abdominal walls, to storing up of fat in the abdomen, and to functional weakness of the diaphragm. Incipient sclerosis of the splanchnic arteries may cause an oppression in the epigastrium, as already mentioned, but may also cause a sensation of fullness in the stomach, flatulence, and tendency to constipation. We find at least some increase in the blood pressure, some hypertrophy of the left ventricle, and sometimes sclerosis of the peripheral blood vessels.

If the patients say that this pain in the right hypochondrium appears especially in the upright position, we must consider ptosis of the liver,

wandering liver, or pedicled tumor of this organ. We must remember that the reason for pain in the hypochondrium, either left or right, may be in the skin, ribs, or intercostal nerves as well as in the underlying organs.

Intercostal neuralgia, although usually bilateral, may occasionally be unilateral, as in tabes or spinal tumor. The abdominal muscles, intercostal muscles, diaphragm at the arch or oblique abdominal muscles may be the seat of pain. This may be seen in recurrent fever or when the patient has weak walls. In these muscle pains we find tenderness upon pinching of the muscle and but little over the incisura, and the pain has no relation to deep breathing. Tenderness of the intercostal muscles may show that the seat of the pain is in these structures. Diaphragmatic pains may be due to overstraining of this muscle, as in severe cough, or in infection, as in trichinosis, and rarely by adhesions of the diaphragm to the kidney. We must also consider affections of the subperitoneal tissue such as I once saw in a case of subperitoneal suppuration in the right hypochondrium, following a subpleural suppuration resulting from a tuberculous sixth rib.

It is also evident that any condition which diminishes the intraabdominal space in the liver region may cause this type of pain. Such conditions are a marked kyphoscoliosis with the con-

vexity to the right side or retroperitoneal tumors behind the liver.

I wish to point out that any disease which may produce pain in the right hypochondrium may do so in several different ways. For example, typhoid fever may cause such a pain by development of typhoid cholecystitis or any other condition of the liver or bile ducts, periostitis of the lower ribs, waxy degeneration of the upper abdominal muscle, pleurisy, etc.

## Pain in the Right Ileocecal Region

### Colicky Pains in the Ileocecal Region

Just as our first thought in colicky pains in the gallbladder region is of disease of the gallbladder, so must our first thought be of the appendix in the presence of colicky pains in the ileocecal region.

The acute appendicitis which is usually combined with periappendicitis is, as a rule, characterized by sudden, intense, but rather continuous pains. Colicky pains are comparatively rare. Real colicky pains will make us think first of appendicular colic, which may be an expression of a real stenosis colic or of adhesions. It is of importance to know that such adhesions may be present even when the primary affection of the appendix is only moderately developed. As premonitory symptoms before an attack we may find general malaise, constipation, dyspeptic complaints, and, in rare instances, diarrhea.

The chronic appendicitis and adhesive appendicitis may remain dormant until an appendicular colic develops which is due to the adhesions. Such colics have the tendency to recur at variable intervals. The manner of production of

these adhesion colics is the same as colic produced anywhere else in the intestine, namely, by limitation of its mobility, kinking, or displacement.

If we find a colic for the first time in the ileocecal region, the following points will aid us in diagnosing acute appendicitis. The appendix may sometimes be palpated as a cylindrical, circumscribed, tender body or mass of exudate. This mass of exudate may vary in size and shape. It is often sausage-shaped, with the long axis parallel to *Poupart's* ligament. It is usually fixed, dull, or dull-tympanitic on percussion and is very tender on pressure except where there is a periappendical exudate, in which case the tenderness is not so marked. It is easier to palpate when the hip joint and knees of the patient are flexed. There is also lagging of the ileocecal region of the abdomen during respiratory movement. The patient keeps the right thigh flexed on the abdomen, there is pain when we pull the spermatic cord on the affected side, and the temperature per rectum is abnormally higher than that in the axilla. We will not be able to feel the appendix in patients in whom the intestines in this region are filled.

Other points which require attention are tenderness on palpation or percussion over *McBurney's* point and lower psoas muscle, provocation of pain by active contraction of this muscle or of the abdominal muscles, hyperesthesias of the

skin, sometimes radiation of the pain to the right lower extremity or even to the right testicle, nausea, often vomiting, constipation, rarely diarrhea, dysuria, which may be quite marked, fever, inability to rest on the left side, and tenderness by rectal and vaginal examination in the direction of the appendix. In some cases, especially in marked gangrene of the appendix, we find a dilated and flaccid rectum caused by a paresis of the intestine. This symptom is very valuable, as we find only moderate tenderness in the ileocecal region in these cases. The condition will be characterized by frequent pulse rate, comparatively low or absent fever, dry tongue, ashy face, and meteorism. There is also pain in the iliac region when we attempt to elicit *Kernig's* sign.

This group of symptoms and the characteristic sequence in which they appear, namely, first pain, then nausea, vomiting, and then fever, will enable us to distinguish between appendicular colic and simple intestinal colic, for which it is sometimes mistaken.

In the senile, there may be only diffuse tenderness and meteorism without any special localization of the symptoms to the appendical region. There is, however, a picture of severe illness, rapid pulse, and only slight fever. The rectal and vaginal examination will be of some help.

The differential diagnosis of appendicitis with recurring colicky attacks and other diseases causing similar attacks will be discussed in the chapter on recurrent colicky pain. I do wish to discuss here two conditions in this connection. The first is mucous colitis, a condition which is often associated with chronic constipation and resulting appendicitis, and which may occasionally set in with acute pain, nausea, vomiting, chills, and local tenderness in the ileocecal region, so that it may easily confuse us. The same may be true of catarrhal or phlegmonous colitis which involves the ascending segment. The difficulties in the differential diagnosis will be great, as we know that diarrhea, even bloody in character and of septic origin, may occur in appendicitis.

The bloody, mucous, or purulent diarrhea may also be due to a perforation of the appendix into the colon. The presence of a large quantity of mucus in the stools speaks rather for colitis than for appendicitis. The leucocytosis in colitis hardly reaches more than twenty thousand. The most important point is the presence of tenderness along the ascendens of the colon rather than at one point. Such a colitis may, however, be followed by a secondary appendicitis. Sigmoiditis or perisigmoiditis may also produce pain in the ileocecal region either by reflex action, adhesions, or compression of the cecum by the dis-

tended sigmoid. The same is true of similar affections of the small intestines.

Simple intestinal colic shows complete absence of pain during the intervals, while appendicitis is, as a rule, accompanied by pains of some degree even during these intervals. These interval pains feel like fullness, flatulence, and pressure in the ileocecal region. Furthermore, these colics are relieved by an enema or carminatives, while the same measures have very little effect in appendicitis. Such a colic may occur in cecal distention resulting from chronic or spastic constipation or any form of chronic stenosis. The pains in these cases also show a wandering character and are relieved by extension of the thigh, contrary to what occurs in appendicitis. We can sometimes find the spastic condition in the ileocecal region or perhaps learn that pain is present at the same time in the left iliac region. The sphincter ani may also be spastic, and the rectal findings will be negative in all other respects.

Local pains in chronic constipation need not necessarily be colicky in nature. Local tenderness, flatulence of the small bowel, and dyspepsia may be caused by a ptosis of the ileum into the pelvis or by kinking, as in *Lane's* disease. The fact, however, that the pains and tenderness do not remain definitely localized, but finally wander along the colon, together with the presence of eosinophiles in the stools in mucous colitis may

clear up the diagnosis. Furthermore, patients with mucous colitis have intervals of complete freedom from symptoms, a condition not ordinarily found in appendicitis.

The second condition is volvulus of the cecum and ascending colon before it becomes permanent. It may cause colicky pains in the ileocecal region for one or two days. There are the usual signs of intestinal obstruction in these cases, with a markedly inflated condition of this part of the bowel. Peristalsis may even be present, but there are no signs of peritonitis.

Stones in the kidney or ureters may also cause colicky pains in the ileocecal region, often with chills and vomiting, but as a rule without fever. This localization is found where there is an incarceration of the stone in the ureter, or if the radiated pain in stone of the right kidney is more severe than the pain at the actual seat of the trouble. Rigidity of the abdominal wall may be present, as well as tenderness in the ileocecal region. Upon close examination, we find that the tenderness is not as strictly localized as in appendicitis, but that it is also present more laterally and higher up. The ureter itself may also be palpable as a vague cylindrical body, which, however, will not lie on the psoas as in appendicitis, but will be rather medial to this muscle.

The tenderness of the psoas is localized chiefly to its upper part, and if there is tenderness in

the lower part, it is not so sensitive as the upper portion. The infrequent tenderness of the lower part of the psoas in these cases is seen in involvement of the entire ureter or when such complications are present as pyelitis, nephroptosis, hydronephrosis, etc. The local tenderness in renal stone is constant, while the tenderness in appendicitis may change its position somewhat to the left. Tenderness on deep percussion over the kidney may be present, and the pain may radiate to the right testicle. This organ, however, is not tender in appendicitis. It is important to find some laked blood cells and albumin in the urine in these kidney cases.

The differential diagnosis between retrocecal periappendicitis and kidney colic will be difficult in spite of the above-mentioned symptoms, especially in the presence of a complicating paranephritis posterior with hematuria or hemorrhagic nephritis. Fever and neutrophilic leucocytosis or leucopenia speaks for appendicitis, while tenderness of the right testicle is a safe criterion of renal disease and is absent in retrocecal disease. Finally, we must make use of the X-ray and ureteral examination.

These two conditions may co-exist either as a result of extension of the appendical inflammation to the periureteral tissue with consequent compression of the ureter, or as a result of extension of the infection via the lymphatics.

The assumption of the existence of a pyelonephritis or acute pyelitis on the right side will be supported by the findings in the urine, leucocyturia and bacteriuria, epithelial cells from the renal pelvis, tenderness on percussion of the renal region, hyperesthesia of the skin in the right lumbar area, and tenderness along the ureter to the right of the navel or corresponding to the upper part of the ileopsoas muscle. We must always think of the possibility of such a pyelitis when we find tenderness over *McBurney's* point in pregnant women, those in the puerperium, or women suffering from constipation. A pyelitis on the right side may result from appendicitis by obstruction of the ureter, exudate, kinking, adhesion, or infection of the stagnant urine.

Other urogenital diseases which may simulate appendicitis are tuberculosis of the urogenital system, hematoma in the perirenal tissues, or a displaced kidney in the cecal region. The latter may produce pains by distortion of the ureter, and it may be mistaken for an appendical tumor or hemorrhagic infarct of the kidney. We know that hematuria may occur in appendicitis, and, therefore, we must not lay too much weight on this finding unless there are renal elements or albumin in the urine. This hematuria may be due to toxic causes, functional constriction of the renal vessels, or retrograde embolus in the kidney.

A purulent or hemorrhagic cholecystitis may also produce symptoms in the ileocecal region, resembling appendicitis when the gallbladder is displaced by marked enlargement, long pedicle, deep position of the liver, or a displacement of all the abdominal organs due to deformity of the spine. Here the chief point of importance will be the fact that the point of tenderness is located somewhat higher than in appendicitis. There is evidence of low position of the liver, with tenderness corresponding to the displaced incisura. We will be unable to outline the upper border of the gallbladder enlargement as we are able to do in periappendical tumor. The latter tumor is, as a rule, more or less parallel to *Poupart's* ligament, while a large gallbladder is usually perpendicular to this line. We may also find a painless tympanitic zone between the dullness of the gallbladder tumor, and *Poupart's* ligament as well as urobilinuria, urobilinogenuria, and nucleoalbuminuria.

### Acute, Continuous Pain in the Ileocecal Region

Acute continuous pain in the ileocecal region is more common than genuine colicky pain. It is of practical value to divide this group into a part with subjective symptoms only and another in which we find objective signs on palpation, as well as symptoms. Our first thought in both

these instances will be appendicitis and periappendicitis.

In female patients, we must consider an affection of the female genitalia when there is a tumor mass in the ileocecal region, and we must carefully examine all female patients with this point in mind. It is especially the parametritis which may simulate the periappendicitis, but torsion of an ovarian cyst, tumor of the Fallopian tubes, and extrauterine pregnancy may also resemble it. The difficulty may be very great as the exudate in parametritis may collect rather high up, while that in periappendicitis may collect in the small pelvis. In addition to a history of previous abortion or instrumentation or gonorrhea, it is important to find an absence of abdominal rigidity and of leucocytosis. There is a strict localization of the pain to the ileocecal region in these cases of high parametritis, and the pain does not begin diffusely with subsequent localization in the cecal area, but rather radiates to the hip. The chief point of tenderness in parametritis is, as a rule, lower than, and a little internal to *McBurney's* point. High fever and a clean tongue point to parametritis. A bilateral tumor usually means parametritis, but we must not forget that an appendicitis may also cause an exudate tumor in the region of the sigmoid. In the latter instance the left-sided tumor appears after the primary one on the right side;

furthermore, it will show no relation to the genitalia. Rectal or vaginal examination will show the periappendical mass situated behind the uterus, while a parametrial mass is located laterally or externally to the uterus, pushing this organ over to the opposite side, while the uterus itself may be fixed to the wall of the pelvis. Bimanual, rectal, or vaginal examination will enable us to distinguish a pyosalpinx from a periappendicitis. A stormy course and peritoneal collapse point to a periappendicitis.

Extrauterine pregnancy with rupture or abortion is manifested by the general signs of pregnancy and *Abderhalden* reaction, but chiefly by the signs of severe intraabdominal hemorrhage with marked anemia, increased pulse rate with normal or subnormal temperature, and collapse in severe cases. Fever may appear later if a secondary infection appears. A retrouterine hematocele which has undergone suppuration will be recognized by gynecological findings. Menstruation may also cause pain in the right iliac region, and we must remember that an appendicitis may light up at this time as a result of the hyperemia in this region.

In regard to differentiation between torsion of an ovarian tumor or cyst on the right side and acute appendicitis, it may be mentioned that in tumor of the ovary the growth is smooth and increases rapidly in size. Moderate leucocytosis

may be present both in tumor and appendicitis and cannot, therefore, be used in the differentiation. The usual gynecological criteria must furnish the chief diagnostic features in these cases. A sign which, according to my experience, may be of some value, is a difference in the size of the pupils, in which the right is larger than the left during an attack of pain arising from intestinal or appendical causes—a sign which I have not observed in pain of gynecological origin.

Female patients often complain of pain in the ileocecal region at the time of menstruation. It must be remembered that various diseases may become clinically aggravated during menstruation, and this is especially true of chronic appendicitis. This disease may begin, or the recurrences may manifest themselves, only at these times.

Torsion of the omentum may produce symptoms resembling appendicitis. The pain appears suddenly, is localized in the ileocecal region, or is diffuse over the abdomen, while fever, vomiting, and constipation are also present. We may find a palpable tumor or dullness in the ileocecal region. Gangrene and diffuse peritonitis will follow if the torsion of the omentum is complete and if its vessels are blocked. If the torsion is incomplete, the pains and tenderness will diminish, while the tender tumor and moderate fever persist. The tumor often feels like a super-

ficial, tender, finely nodular, well-defined mass which may rapidly increase in size, even reaching to the size of a head. The fact that the dullness is not so diffuse in the ileocecal region as in appendicitis, but is more circumscribed by a tympanitic zone to the right of the dull area, may be of some use. Leucocytosis is not so marked as in appendicitis.

Acute pericystitis may also come into question in some cases. In cases in which the appendix or the resulting inflammation extends into the pelvis, we may have strangury, dysuria, and retention as predominant symptoms. The finding of a large mass on rectal examination speaks rather for a periappendicitis, as such a large mass rarely occurs in pericystitis. In favor of appendicitis is the absence of previous urinary disturbances. Albumin or pus in the urine speaks, of course, for cystitis, but a periappendicitis may extend to the bladder and secondarily involve the perivesicular tissues. Perforation of the appendix into the bladder has been observed, and the process may either heal or a chronic fistula may result. The finding of cholesterin in the urine is, according to my experience, of importance in these cases of perforation. Usually, however, this process is chronic, extending over many years, and is mistaken for prostatitis, cystitis, etc. We are more likely to be mistaken in those cases in which there is pus in the

urine and no mass in the ileocecal region, as we are apt to consider these findings as signs of a disease of the bladder itself.

Acute perityphlitis is an inflammation or suppuration of the ileocecal region which is not the result of an appendical lesion. The clinical symptoms of both conditions are practically the same, the leucocytosis is, however, less marked in perityphlitis. The chief differential point is in the determination of the cause. Ulceration of any type or diverticulum of the cecum or infection by a hematogenous route will cause perityphlitis rather than appendicitis. Tenderness on percussion in perityphlitis is more marked in the flanks than anteriorly, and there may also be edema of the flank and tumor in the ileocecal region, and the right hip may be flexed. Stercoral perityphlitis may follow constipation, but this latter finding can hardly be used in its differentiation from appendicitis, as it occurs in both conditions. X-ray is also of some value in the differentiation between these conditions.

We meet with a complicated condition in the presence of tuberculous ulcers in the cecum or appendix. Tuberculosis may involve both the appendix and the cecum or the former alone. The tuberculous appendicitis resembles the simple acute appendicitis very closely, but is distinguished by the subacute course, the hectic fever, and the moderate degree of the objective

findings. The picture of simple acute periappendicitis is very closely imitated when such a tuberculous appendicitis perforates into a previously walled-off peritoneal pocket, or if the inflammation extends by continuity to the periappendical tissues.

Tuberculous ulcer of the cecum without involvement of the appendix may be followed by a local adhesive peritonitis, usually tuberculous in nature. Tuberculosis of the cecum produces early vomiting and diarrhea and later constipation and also colic. The X-ray may help us to recognize the condition. Perforation of such a tuberculous cecal ulcer into this adhesive peritonitis may occur and may produce multilocular pockets which may contain feces or pus. It is more rare for the cecum to be secondarily infected from the appendix. We may be able to palpate a mass in the ileocecal region if there is no pre-existing peritonitis. The clinical symptoms of perforation of such a cecal ulcer will depend on the existence of a previous walling off of the process. If the process is not walled off, we find the severe symptoms of a localized peritonitis. If walling off has occurred, the pains of the perforation may be very moderate or even absent, and the formation of such a fecal abscess may be as symptomless as in carcinoma.

Perforation of an ileocecal ulcer with plugging of the hole may not be followed by the typical

general symptoms of perforative peritonitis, as, for example, when we are unable to demonstrate free air in the peritoneal cavity and when the abdomen is soft and somewhat tender with no rigidity on light palpation and either meteorism or a drawn-in abdomen. Tenderness of marked degree may be obtained on deep pressure; there is only transient rigidity and then only during the time that deep pressure is applied. We may explain these latter phenomena in patients with lung tuberculosis by assuming that the muscles are atonic as a result of loss of strength. There may be the usual outspoken symptoms of acute perforation peritonitis over the involved area.

There is another possible relation between tuberculosis and pain in the ileocecal region. In addition to the rare cases of diffuse tuberculous peritonitis which set in acutely there are also localized tuberculous peritonitis with acute onset. Such a condition may be secondary to tuberculous affection of the intestines or female adnexia, or it may be a primary localized serositis. In these cases, as in acute periappendicitis, we see an acute onset with pain, fever, nausea, and vomiting and a perityphlitic tumor mass develop in a short time. This mass consists of serotuberculous exudates with adhesions of the omentum. The course of the disease, absence of leucocytosis, and marked and constant *Diazo* reaction will all be of importance. Signs of tuber-

culosis elsewhere, although suggestive, are not conclusive evidence that the abdominal condition is also tuberculous.

Comparatively mild pains in the ileocecal region may be due to an early stage of localized, dry, tuberculous peritonitis in this region. Another condition causing recurring colics in the ileocecal region is tuberculosis of the mesenteric or pericecal glands.

Diffuse, tuberculous peritonitis, setting in like an ordinary acute periappendicitis, will be recognized by its course. Generally the fever diminishes after a few days but does not entirely disappear. The diffuse tenderness which is especially marked in the ileocecal region may remain constant. The pulse remains wonderfully good and may be in striking contrast to the fever. The abdomen is somewhat distended, ascites develops, and the *Diazo* reaction is positive. These are all important findings.

General miliary tuberculosis may cause appendical symptoms as a result of development of miliary tubercles on the peritoneum in the ileocecal region or by irritation of the intercostal nerves or diaphragmatic pleura. The diagnosis will be based on the ashy cyanosis, rapid breathing, absence of auscultatory findings over the lungs upon which there are areas of tympany, choroid tubercles, enlargement of the liver and spleen, and the positive *Diazo* reaction in the

urine. There may be meteorism, but the abdomen can be pressed without causing pain. The X-ray examination may be of some value in these cases.

Pneumococcic peritonitis may also localize in the ileocecal region just as may localized tuberculous peritonitis. The pneumococcic exudate tends to localize in the periumbilical region. As before mentioned, it is especially common in young girls, it is often accompanied by diarrhea and herpes, and we may find the bacteria, leucocytosis, and increased fibrin in the blood.

Typhoid may also lead to acute perityphlitis with or without demonstrable exudate. It may follow typhoid ulceration of the cecum. The same clinical picture may occasionally be present as a result of marrowy swelling or even suppuration of the paracecal glands or typhoid ulceration of the appendix, which in rare cases may lead to scar formation with stenosis or kinking of the appendix and resulting stasis of the contents with subsequent infection. In such cases, the symptom complex of typhoid fever will be followed by the characteristic symptom sequence of appendicitis. The rapid increase in pulse rate and the local symptoms will be suggestive.

Typhoid ulcer of the ileum, cecum, or appendix may lead to periappendicitis or perityphlitis in another way, namely, by perforation into a previously walled-off space or by extension of

the inflammation through the serosa. In these cases there will be the usual typhoid history, acute tumor of the spleen, diarrhea, leucopenia, and the bacteriological as well as the serological findings. Ambulatory typhoid may sometimes cause a similar picture and lead us to believe that the periappendicitis occurred in a previously healthy person. Typhoid is more likely to cause perityphlitis than appendicitis, by perforation or extension of a typhoid ulcer.

Typhoid fever as such may produce a genuine typhoid appendicitis even in the absence of a perforating ulcer. As a matter of fact, the intestinal involvement in typhoid may be strictly limited to the appendix, or the process may begin with pseudoappendical symptoms which are probably caused by intense swelling of the lymphoid tissue in this organ. We must also remember that typhoid fever may light up a dormant appendicitis as a result of the local hyperemia. A relapse of typhoid may begin with ileocecal pains even if the first attack did not show such a picture. The typical local findings of appendicitis may be found in all these cases.

The following points suggest typhoid fever: the pulse is slow and dicrotic, a feature which occurs only rarely in appendicitis, there is marked initial headache, and the blood may show leucocytosis early, but is soon followed by a leucopenia with a relative lymphocytosis, while a rela-

tive polynuclear leucocytosis is always present in appendicitis, even in the presence of an absolute leucopenia in the very septic cases.

The same that has been said about typhoid applies to paratyphoid fever. Malta fever and malaria may also cause similar symptoms.

Lobar pneumonia may cause pain in the right iliac region, especially in young people. This is most common in involvement of the right lower lobe with radiation of the pleural, diaphragmatic, or perihepatic pains by irritation of the intercostal nerves or of the diaphragmatic pleura, by secondary pneumococcic peritonitis either localized at the cecal region or diffuse, or by lighting up of a dormant appendicitis. Lobar pneumonia in these cases is recognized by the flushed face, initial chill, headache, lagging of one side of the thorax on respiration, bulging of the ileocecal region during this act, absence or diminution of *Litten's* sign, cough, herpes, blood findings, and strikingly high rate of respiration as compared with the pulse rate, so that normal proportion of one to four is reduced to one to three or even less. The rigidity of the abdominal muscles may be caused by irritation of the parietal peritoneum and transmitted from the pleura via the intercostal nerves. This rigidity is, as a rule, more diffuse than in appendicitis. If we find such a rigidity and, in addition, a localized area especially marked over the

ileocecal region together with vomiting, singultus, and fever, we must suspect a localized peritoneal involvement which may or may not be followed by pneumococcic periappendicitis. In simple peritoneal irritation or peritonism, we obtain marked tenderness on superficial pressure, but if we palpate slowly and more deeply, the tenderness is not so intense. The tenderness increases with the pressure in true peritonitis.

We must not forget the possibility of an actinomycosis when we are dealing with an appendicitis or perityphlitis if there is an exudate mass. The diagnosis will be possible only under favorable conditions. There is very little or no fever in spite of the presence of a mass, the pains and vomiting are moderate and often recur, and the tumor is adherent to the skin, which may be edematous, thick, and of a strikingly grayish violet color over this area. We must look for a possible portal of entry, examine the serum and pus from a fistula, perform the specific agglutination test, and look for the organism in the feces. Chronic actinomycosis of the cecum may also become secondarily infected and may produce acute attacks very much resembling acute appendicitis. On the other hand, the absence of an acute onset should remind us of the possibility of an actinomycosis or tuberculosis of this region. Carcinoma and lymphosarcoma of the cecum and carcinoma of the appendix, as well

as foreign bodies in the latter, must also be mentioned. Carcinoma of the cecum may become secondarily infected and cause fever as a result of this even if there is no infection.

Pyonephrosis may also produce pains in the ileocecal region with fever, leucocytosis, and a severe general course. The pyonephrotic sac is usually high up but may be located in the appendical region, especially if the kidney is displaced downwards. We must always try to define the shape of the mass, as the tumor may be the kidney which has been pushed down by a suprarenal, subphrenic abscess. X-ray sounding of the ureters, and inflation of the intestines will be of great value, especially in the presence of marked abdominal rigidity. The presence of the tumor mass behind the cecum after inflation will be of diagnostic importance in pyonephrosis or affections of a displaced kidney, such as stone, tuberculosis, torsion of the ureter, etc.

Pleurisy and diaphragmatic pleurisy may also simulate appendicitis in the same way in which the pleural involvement in pneumonia causes this phenomenon. Here, again, we find only superficial tenderness in the ileocecal region, with no marked rigidity. The differential diagnosis may be difficult in empyema where we also find a high pulse rate, leucocytosis, and severe sepsis.

Purpura abdominalis will be recognized by the hemorrhages into the skin and mucous mem-

branes, occult or manifest malena, pains or swelling of the joints, vomiting, constipation, and increased temperature during the attack. Tenderness is found rather over the entire cecum than over *McBurney's* point alone. There is also eosinophilia and increase in the number of blood platelets.

Hemorrhagic diathesis must remind us of the possibility of a leucemia, a condition in which moderate ileocecal pains may occur. We must carefully examine the condition of the gums, spleen, glands and blood. This disease may be easily overlooked, especially when there are pains in the throat and fever.

Acute epidemic cerebrospinal fever may be accompanied by pains in the ileocecal region with local rigidity and vomiting. These symptoms are caused by inflammatory irritation of the spinal roots.

The gastrointestinal type of influenza is characterized by severe prostration, pains in the muscles and limbs, initial headache, tenderness of the sinuses, frequent diarrhea, symptoms of catarrhal involvement of the respiratory tract, and the usual bacteriological findings. As a rule there is diffuse tenderness in the ileocecal region rather than a distinctly localized painful area. In the last epidemic of influenza we sometimes found a mass in the ileocecal region which was an hemorrhagic colitis, appendicitis, or lymphadenitis.

Scarlatina may cause pain in the ileocecal region in children, with vomiting, probably as a result of the inflammation of the lymphoid tissue in the appendix. The same is probably true in cases of acute infectious angina with ileocecal pains. Such attacks have been observed in five-day fever with diminution of the pains during the intermittent intervals.

Osteomyelitis of the right femur, pelvic bones, and sacral and lumbar spines must also be mentioned. Pseudoappendicitic symptoms, such as abdominal pain in the right lower quadrant, acute onset, fever, vomiting, diarrhea, and flexion of the hip joint may occur when the focus is near the knee as well as when it is near the hip. Pain will be elicited by moving the thigh in any direction, and there is muscular fixation of the hip, no rigidity in the cecal region, or tenderness over the appendix, but there is marked tenderness and swelling of the thigh. X-ray may help us to clear up the diagnosis. Osteomyelitis of the right iliac bones near the crest or near the right sacro-iliac joint or symphysis may produce similar symptoms. The X-ray and localization of the symptoms and of the tenderness will clear up the diagnosis.

We occasionally find patients with syphilis in the secondary stage who complain of intense ileocecal pains and fever.

Dysentery extending high up may cause pain

in this region as a result of spasm of the colon, but the usual history and examination, especially of the stools, together with the serological findings, will help us in the diagnosis.

Intestinal anthrax may produce a tumor mass over the appendix region, but this is not a constant finding. There are chills, fever, moderate pains, and marked tenderness in the ileocecal region. Ascites, either serous or hemorrhagic, is found in the early stages. The tumor may be palpable on rectal examination. This tumor may consist of carbuncles of the cecal mucosa or of hemorrhagic edema of the submucosa.

Children may have intestinal parasites in the cecum, and these may produce pseudoappendical symptoms, even if the worms do not enter the appendix. Intense pains in the cecal region may appear, as may signs of peritoneal irritation such as nausea, vomiting, diarrhea, fever, and even a tumor-like mass. This is most common in ascaris but has also been seen in trichocephalus dispar. It will be important to examine the stools of these cases for eggs or parasites and the blood for eosinophilia. The stools in ascaris show a markedly disagreeable, aromatic odor. Eosinophiles may be also found.

Purulent periureteritis must also be mentioned. It may be an extension by contiguity from the ureter, or perforation, as by a stone. In both instances there is sudden, intense pain, vomiting,

fever or subnormal temperature, bowel disturbances, perhaps complete stoppage of feces and flatus, and a very tender, quickly developing tumor in the ileocecal region. The diagnosis may have to be based only on the history in these cases, as all examination, even X-ray, may be dangerous or even impossible.

The simple acute ascending inflammation of the ureters, as from primary affection of the prostate, bladder or female genitalia, will be characterized by pains, vomiting, fever, and the presence of a tender, tubular mass, which is dull on percussion and which corresponds to the ureter. The localization of this mass in the usual location of the ureter, on the inside of the small pelvis, as well as the tender points along the location of the ureters, will be suggestive of an affection of this part. We find similar signs in acute hydroureter such as is seen in pregnant women. Such cases may also show pains which radiate to the loins, with tenesmus and diminution in the output of urine.

Gonorrhea of the vas may also resemble the picture of appendicitis by causing fever, pain, and local tenderness. I have also seen a case of inflammation of the vas with bilateral pains in the iliac regions after typhoid which later healed without any traces of the affection.

Acute psoas abscess may simulate appendicitis, especially when there is a perityphlitis result-

ing from the abscess. We find the same posture of the patient with his flexed thigh and knee, and there is no vomiting and no typical tender point or hyperesthesia of the abdomen. Simple appendicitis does not force the patient to keep his thigh flexed all the time, while psoas abscess, retrocecal inflammation, or retrofascial inflammation causes the patient to maintain this attitude constantly. There are no signs referable to the intestines proper. The psoas abscess may be bilateral but is differentiated from an extension of the appendicitis to the left side by the fact that the former develops simultaneously on both sides, while in appendicitis the process is first seen on the right and then on the left side. Bilateral psoas disease will cause a bilateral fixation of the hips, while we do not find fixation of the left hip in perisigmoiditis. It is impossible to over-extend the hip joint in the former condition when the patient is in the prone position. This sign is of especial value in cases of psoas affection developing acutely, as after trauma. We must try to find the primary focus as in the ribs or spine.

In cases of chronic psoas abscess, the pains are not so marked as in appendicitis, and may even be entirely absent. The tumor is much flatter, and the pains have a tendency to radiate to the thighs and genitals, a radiation which occurs only in the retrocecal type of appendicitis and which may be followed by an involvement of the psoas

muscle. X-ray will be of value, in that it will show displacement of the cecum and that the first part of the ascending colon is pushed to the left in psoas abscess. A marked leucocytosis and the before-mentioned pupillary difference will point to appendicitis unless there is considerable lung involvement.

Purulent or tuberculous disease of the hip joint will cause similar symptoms either by perforation of the pus through the bony fossa into the large pelvis and then into the psoas, or as a secondary suppuration of the lymph glands in the ileocecal region. In addition to the X-ray findings, the limitation of the hip joint in all directions is of importance. Vomiting and suppuration may occur in the before-mentioned suppuration of the glands. If a tuberculous hip joint is followed by a localized and later diffuse tuberculous peritonitis, the sequence of symptoms will be of importance. There are symptoms referable to the joint, later, signs in the ileocecal region, and still later, signs of a diffuse peritonitis. When the heel is suddenly pushed while the entire lower extremity is in full extension and somewhat raised, the patient will complain of pain in the hip joint. If the sign is to be of value, however, the patient must localize the pain with certainty in the hip joint. An uncircumscribed pain in this region when this test is performed may be due to acute appendicitis and peritonitis but is not pres-

ent in appendicitis which is walled off. I wish to point out that an appendicitis may produce a metastatic coxitis which in turn may cause a slight degree of lameness, neuritis of the crural nerve, or reflex involvement of the psoas muscle.

An undescended testicle may come in question if we find only one testicle in the scrotum. Acute inflammation of such a testicle or of the descended organ may simulate appendicitis, especially when caused by trauma or local or general infection. For instance, in epidemic parotitis such inflammation of the testicle may occur as the only symptom of this disease and may be followed by pains, fever, and vomiting. The same may occur in females with oöphoritis on the right side. In cases of torsion of an intraabdominal testicle, there may also be ileus and collapse; or the passing of a testicle through the inguinal canal may cause faintness, intense pain in the ileocecal region, vomiting, and constipation. Sarcoma of such a testicle may produce fever and a rapidly growing tumor.

Intussusception in the ileocecal region will be characterized by the absence of signs of inflammation in the early stages of the disease, moderate or even no tenderness of the palpable tumor, and no typical tender points or hyperesthesia of the skin, but there will be a distinct peristalsis near the tumor mass.

Other conditions are volvulus of the cecum and

purpura abdominalis of the lower loops of the ileum, as well as compression of the cecum by a wandering organ, as a spleen or kidney.

Carcinoma of the cecum may run a mild course and suddenly light up with a stormy clinical picture. In all cases of tumor in the ileocecal region we must exclude the possibility of a fecal mass, as the nodular surface and hardness may lead us to believe that we are dealing with a malignant tumor. Such a fecal mass may remain even after an effective enema or after several bowel movements.

Acute phlebitis of the right iliac vein may show intense and sudden pain in the ileocecal region, and local tenderness and rigidity; but I have also seen cases with no vomiting or other intestinal disturbances. The presence of general sepsis, inflammation, or neoplasm in the lower extremity, small pelvis, or the vicinity of the iliac vein is of importance. Cases of embolus or thrombosis of the superior mesenteric artery or vein, especially of the ileocolic vessels, may begin with stormy and diffuse symptoms or with localized pains in the ileocecal region.

Affections of the lymphatic glands in the vicinity of the ileocecal region may cause pseudo-appendical symptoms. It is especially the pericecal glands which may enlarge and become painful without any involvement of the appendix itself. The diagnosis may be made on palpation

of these glands. Such affections of the glands may result from plague or other acute infectious diseases, as well as from tuberculosis, acute granuloma of *Sternberg,* leucemia, and neoplasms. Inflammatory infections of the lower extremity may involve the glands in this region without affecting the inguinal glands. Inflammation, infection, or hemorrhage into the mesenteric glands, as in typhoid, may also cause such symptoms. Free bleeding in this region, as from hemorrhagic diathesis or erosion of a vessel, as by carcinoma, may also cause this picture. Retroperitoneal hematoma of traumatic origin or a perirenal hematoma which has gravitated downwards may cause such pains. Signs of acute internal hemorrhage will be of importance in all of these cases.

Another cause for pseudoappendical pain is tumor in the retrocecal region, either benign or malignant. The pain may be caused by the tumor itself or by the results of necrosis. Acute appendicitis may even be caused by an extension of the infection from the tumor mass.

Very sudden and intense pains with shock should always remind us of the possibility of a rupture of the intestine, a condition which occurs most frequently at the cecum because this is the favorite place for ulceration of various types and also the thinnest part of the colon. The cecal contents are likely to disintegrate with gas formation, and this collection of gas will be kept *in*

*situ* by the ileocecal valve, while the thinness of the wall allows a maximal distention at this place. This condition may produce intense pains in the cecal region, as the pains are greatest in the place of greatest distention rather than in the place of obstruction. Vomiting will appear rather late and practically never on the first day as in appendicitis. The enlarged colon may be palpable, and there may be tenderness over the obstruction as well as over the region of greatest distention. There is usually no leucocytosis and no abnormal difference in the rectal and axillary temperatures will be noticeable.

We will find the usual signs of intestinal obstruction in these cases. This picture occurs in organic stenosis, in marked ptosis of the transverse colon, with kinking of the bowel, or after an enema, especially in a cecum which has formerly been diseased. It will be of importance in cases of cecal collections of gas to find bulging in the flank while there is no meteorism in the region of the navel. Perforation of the cecum in such a case will produce free air in the peritoneal cavity.

Perforation of the stomach or any part of the small intestine from any cause may produce a picture in which the subjective and objective findings are most marked in the ileocecal region or at *McBurney's* point. This may be explained by the fact that the exudate gravitates to this

region and is more superficial here than in its former location. If we obtain tenderness over the epigastrium with radiating tenderness over the appendix by pressing over the former location, we may be dealing with an appendicitis, but if there is no such radiation, then it is very likely that there is no true primary appendical involvement. The difficulty will be very great in those cases of perforation in which there is no epigastric tenderness at all. If we can examine the patient within twenty-four hours after the rupture, we may find rigidity only of the upper rectus muscle and none in the ileocecal region. The abdomen may be drawn in as the course progresses. Very important is the type of radiation of the pain. In perforation of the stomach, the pain radiates to the left of the spine, left shoulder, or between the shoulder-blades. In duodenal ulcer the radiation is to the right of the spine, at the level of the duodenum. The absence of fever or even the appearance of a subnormal temperature immediately after the onset of the pain points rather to perforation of an ulcer than to appendicitis. The previous history will also be of some value. Costal respiration is not characteristic of rupture of the upper part of the gastrointestinal tract, as it may also occur in perforation of the lower portions.

Displacement of the pylorus, as in marked ptosis or dilation, may, in the presence of disease

of this part, simulate appendicitis when the pylorus lies near the region of the appendix.

Other diseases which may occasionally resemble appendicitis are pancreatitis, diaphragmatic hernia, or pancreatic necrosis. The entire abdomen, or at least the greater part of it, will be tender, while rigidity is often absent. Fat necrosis near the appendix in cases of pancreatic disease may be the cause of such pains. A mass composed of adherent intestines may even be felt.

For the differential diagnosis between appendicitis and gallbladder disease see the chapter dealing with liver colic and gallbladder disease. In this connection it may be mentioned that a frequent cause of radiation of pain from the gallbladder region to the appendix may be brought about by a nephroptosis of the right kidney.

Acute intestinal urticaria may cause similar symptoms, but we also find either an urticaria of the skin at the same time or eosinophilia in the blood or feces at a later period, and the condition may improve under calcium treatment.

Pseudoappendicitis may occur as a form of hysteria or neurasthenia, especially of a visceral type, usually in the presence of some slight intestinal trouble. There is no alteration of the pulse or temperature, there are no local objective signs, and the tenderness in the appendical region is only superficial, and as shown by the fact that raising of a fold of skin causes pain, while deep pressure

which is slowly increased is less painful. Dysuria may be present in these cases. The course of the affection will show the true nature of the disease.

It must be mentioned that there may be a so-called high hysterical fever with a palpable tumor mass formed by the contracted cecum. We must remember that there is a point of tenderness over the ovaries, or even somewhat higher, as at the level of *McBurney's* point, in hysteria, and we must not mistake this point for one of appendical origin. In regard to the stigmata of hysteria it must be said that the presence of these does not prove that the pains in question are of hysterical nature. This conclusion is best reached by noting that there is a disproportion between the severity of the symptoms and the physical signs.

Patients suffering from appendicitis may experience pains after eating because they fear to take sufficient nourishment, and as a result they lose weight and strength. A secondary neurasthenia may develop as a result of this. These patients will complain of pain in the same region in contradistinction to pains of functional origin which have a tendency to shift in location.

*Quincke's* angioneurotic edema may also cause transitory pains in the ileocecal region. The presence of periodic edema of the skin and mucous membranes, intermittent swelling of the joints, gastric disturbances, and pseudoasthmatic attacks

or attacks of migraine, and possibly the family occurrence, will be of value.

Bleeding in the covering layers of the spinal cord of the lower thoracic portion, acute purulent peripachymeningitis, and fracture of the transverse process by caries of the spine in which the segments are brought closer together and in fracture of the lower ribs, all these may be followed by pains in the ileocecal region due to irritation of the posterior spinal roots. Herpes zoster will occur in cases of fracture of the ribs as well as reflex rigidity of the abdominal muscles, sensory disturbances, and other disturbances resulting from affection of the spinal column.

Simple neuralgia of the intercostal or upper abdominal nerves, as in influenza or malaria, may cause difficulties. Similar pains may be caused by irritation of the nerves by a retroperitoneal or kidney tumor. The presence of paravertebral points of tenderness, the superficial location of the pain, and the course and radiation and diminution of the reflexes on the affected side will be of importance. There are rare cases of sciatica which begin with pain in the ileocecal region and which may even show tenderness at *McBurney's* point. There will be pain and tenderness along the crural and sciatic nerves in addition to the other symptoms. We must not forget that a sciatica may be purely symptomatic in a genuine appendicitis.

Tabes dorsales may cause pain in the ileocecal region, either as an abdominal crisis or by girdle pains in the region of the right iliohypogastric or ilioinguinal nerves.

Caries of the spine may cause such pains either on a nervous basis or as a result of a psoas abscess in the ileocecal region.

Early stages of acute anterior poliomyelitis may imitate appendicitis by causing initial vomiting, gastroenteritic symptoms and fever, especially if hyperesthesia of the skin and intense muscle pains are localized in the lower right abdomen. Similar areas of hyperesthesia and tenderness elsewhere, the absence of one or more tendon reflexes, leucopenia, sweats, and muscle pareses will aid in the diagnosis.

Tetany may occasionally set in with intense cramps in the abdomen, and the spasm of the colon may be so marked that it closely resembles the clinical picture of intestinal obstruction. The pains in this condition may be due either to the cramps or to the causative pyloric stenosis or other factor of the original tetany.

*Graves'* disease may occasionally cause pains in the ileocecal region as a result of the diarrhea and may persist for several days. The moderate pains in the abdomen may be due to some affection of the lymphoid structures in the small intestines, as in a "cold," etc., which involves the tracheal glands and extends to the other lymphoid

structures. In cases of general lymphoid hyperplasia, symptoms of appendicitis may occur as a result of this hyperplasia without any actual inflammation of the appendix itself.

Inflammation of the skin and muscle of the abdominal wall over the appendix may resemble appendicitis but is recognized by the superficial tenderness, doughy swelling in the skin, and abscess in the muscle. Real myalgia, due to rheumatism or overwork, must also be considered, as there may be tenderness on the external border of the rectus near *McBurney's* point, since the nerves enter their sheaths at this place. This tenderness will be bilateral, and is more marked on raising up the head, while in appendicitis there is less tenderness upon contraction of the rectus. The tender point will shift with the particular point in the abdominal wall as the patient changes position. The place of intersection of the muscles may also be tender. A history of over-exertion, as cough, strain, etc., will also be of value. A tear in the abdominal muscles will be recognized by the local swelling and tenderness.

### Recurrent Pains in the Ileocecal Region

If a patient complains of recurrent pain in this region, with the typical symptoms of appendicitis and after proved previous attacks of appen-

dicitis, we will of course consider the present attack as arising from the appendix.

The most common causes are chronic changes in the appendix or its peritoneal vicinity, if the appendix has not been removed. We find moderate, dull pains after meals, while the patient is walking upstairs, while he is stooping over, or during movement of the bowels. There are local tenderness and gurgling, and sometimes a strand-like mass may be palpable. The attacks may be very intense, with vomiting and fever. Adhesions may indirectly cause attacks by forming diverticulæ in the cecum, in which places stasis of fecal material may occur. Spasm of the colon, due to nervous disturbances or adhesions, may also cause such attacks. The occurrence of appendicular colic is another frequent cause.

Inflammation and suppuration may also extend to the omentum, causing omentitis. In these cases the tumor appears to be located immediately behind the abdominal walls and is flat and quite large. The omentum may be fixed in the ileocecal region after removal of the appendix, and when it becomes painful it may resemble a genuine appendical attack.

Other conditions which may cause attacks of pain after previous attacks of appendicitis are abscess of the abdominal wall and constipation colic. The pain in colic will be of the true intestinal type of colic, with attacks of a few minutes'

duration in wave-like rise and fall of intensity, and with a tendency to wander from right to left. These pains need not always begin in the ileocecal region. Local pressure lessens the pain; there may be scybala in the rectum or sigmoid, and an enema brings relief. What has been said of constipation colic is true in simple colic after a dietetic or "cold."

If a typhlocolitis was the cause of an appendicitis, it may still be the cause for future attacks of pain after the appendicitis has subsided. Ptosis of the colon and mucous colitis must also be considered.

Adhesions may be located in the transverse and ascending colon and may lead to intermittent attacks of flatulence with painful distention of the cecum or incarceration by strands of adhesions. The X-ray will be of value in these cases. The ureter may be involved by the inflammation, and connective tissue may form about it, causing a stenosis with resulting colics. Such a stenosis may be followed by a pyelitis or even formation of stones in the pelvis of the kidney.

Postoperative hernia in or through the abdominal wall may be the cause of repeated attacks of pain in the appendix region after removal of this organ. Varices of stumps of the ligated veins after operation may produce a tumor mass in this region.

Finally, we must remember that a dormant

infectious process or focus may remain after a gangrene of the appendix and may light up several months after operation.

Chronic, recurrent pains in the cecum may be due to cecum mobile, or atony of the cecum, both conditions being a part of a general atony or enteroptosis. The attack itself may be caused by a torsion of the abnormally movable cecum, possibly by transient spastic contractions in this region, or occasionally by a sceondary typhlitis which may be ulcerative in nature. The pains may recur at intervals of hours, days, or weeks and may resemble those in ordinary neuralgia.

We find, as a rule, little or no fever during these attacks; the pains at times show a relation to the quantity or guality of food, and it may depend on the tonus of the abdominal wall. The pains are increased when the patient is walking, or when he assumes certain positions. These pains are diminished and sometimes disappear if the patient assumes the right-sided position. The pains are in the ileocecal region and especially along the external border of the cecum and ascending colon and may radiate to the gall-bladder or right kidney or even be diffuse over the entire abdomen. The colic may remain for one or two hours and disappear on the passage of ill-smelling gas or feces which may even contain pus or blood. The patient may experience a sensation of gurgling or bulging in the cecal

region. *McBurney's* point may be tender but is not the point of maximum tenderness. As already stated, the maximum point of tenderness is along the external border of the cecum and ascending colon. The abdominal rigidity is usually only slight. We are often able to palpate the cecum as a movable, tense, elastic, cushion-like mass, about the size of a small apple, which may show periodic change in all its features, and which may show a gurgling or splashing on deep palpation.

These are signs of dilatation of the cecum. We may sometimes palpate the last part of the ileum as a thin strand leading to the cecum. X-ray may show a bismuth residue in the cecum even after twenty-four to seventy-two hours. The patients are not entirely well in the intervals between the attacks; they usually complain of constipation, irregularity of bowel movements, and a feeling of local distress. The gurgling and splashing and signs of a dilated cecum may also occur in chronic appendicitis, and they are therefore not pathognomonic of either condition.

Among the other anomalies are very low position of the ascending and transverse colon or of the latter alone, which may lead to chronic constipation. This constipation may cause either pseudoappendical symptoms or even a real appendicitis.

Other conditions are lead colic, arteriosclerosis

of the superior mesenteric vessels, recurring spasms of the colon, and simple ulcer of the large intestine. The latter is analogous to the gastric ulcer and is probably caused by local disturbances in the circulation. The diagnosis of this disease is very difficult. We find it in those places where the intestinal contents are apt to tarry, as in the cecum or sigmoid flexure though not so commonly in the splenic or hepatic flexures. When localized in the cecum we find cramp-like pains which are intense and recurrent and which are relieved by passage of stools or flatus. We find local tenderness and occult or manifest bleeding, but nothing of striking appearance in the stool. Most of the cases which have perforated have been mistaken for appendicitis.

Stenosis of the cecum or ascending colon may be due to carcinoma, scars, or tuberculosis with stenosis of the lumen. We find chronic, recurrent, colicky pains in the ileocecal region in these cases, with constipation or constipation alternating with diarrhea. Vomiting may also occur. If there is a palpable tumor with stiffening we may easily make a diagnosis, but even if these signs are absent we may suspect the condition when we find colicky attacks lasting a few minutes or seconds with wave-like increase in severity, sensation or stiffening or bulging and a feeling of stagnation in the ileocecal region, and sometimes the patients feel as if there were something

gurgling or squirting at the end of an attack. There may be occult blood in the stool, and there may also be large numbers of spirillæ or spirochetes in the feces. The change in intestinal flora, spirochetes, and X-ray findings will enable us to distinguish this condition from stenosis due to tuberculous peritonitis.

Senile patients do not often have a stormy onset in appendicitis while adhesions or even emaciation may develop and simulate malignant disease. Lymphosarcoma does not usually cause direct stenosis of the intestine at the cecum, but narrowing may occur from kinking or pulling on this part by the extraneous part of the tumor. The contrast between the strikingly large size of the tumor and the absence of stenosis will be suggestive of this condition.

Chronic ileocecal invagination will imitate a chronic periappendicitis of recurrent type with a palpable tumor. The patient complains of recurring colicky pains lasting twelve to twenty-four hours, which reappear after a few days with nausea and vomiting. Typical tender points and rigidity of the muscle will be absent, while stiffening and visible peristalsis may be present. Profuse malena occasionally occurs. The chief feature is the intermittent contraction of the tumor on palpation.

Large foreign bodies or maggots may also produce such symptoms of appendicitis. Other con-

ditions are large hernias on the right side or patent rings, adhesions of the small intestines, adhesions about the ascending or transverse colon, especially at the splenic flexure, or malignant growths high up in the colon, as at the cecum, followed by distention colics of the cecum.

A large sigmoid as in *Hirschsprung's* disease may also cause similar symptoms and is sometimes accompanied by membranous colitis.

Acetonemic vomiting in children may also produce pain in the ileocecal region, but there will be copious vomiting, acetone odor of the breath, acetone bodies in the urine, and slow breathing. There are cases of duodenal ulcer in which the pain radiates to *McBurney's* point. Early or dormant pulmonary tuberculosis may cause either epigastralgia or pain in the ileocecal region with tenderness over *McBurney's* point.

## Chronic Continuous Pain in the Ileocecal Region

Such chronic complaints may vary from a sensation of fullness in this region to severe pains. We must mention the conditions discussed in the previous chapter and especially chronic appendicitis and periappendicitis. The chronic complaints in appendical disease may be due to chronic inflammation of that organ, even purulent or empyemic in nature, or to local peritoneal adhesions, especially with the omentum, which

may also enclose pockets of pus. Other possibilities are distortions, kinking, and hydrops of the appendix. These cases may be but a local exacerbation or general septic spread by the portal vein.

Adhesions about the appendix may cause constant complaints of temporary colicky attacks, constipation or constipation alternating with diarrhea, anorexia, nausea, flatulence, and fever, especially before menstruation but no palpable tumor. Hernia may also cause a similar, chronic, continuous pain, as will also carcinoma of the appendix or cecum, in which latter a tumor is not necessarily palpable. There are gradually developing symptoms of chronic appendicitis without any previous acute attacks. In addition there are marasmus and anorexia. The patients are usually well along in years. There may also be occult malena. In patients between forty and fifty years of age who have always had normal bowel movements but suddenly begin to complain, without any special reason, of irregular bowel movements, flatulence, or colicky pains, we must suspect malignancy of the colon or cecum.

Tuberculous ulceration of the intestines causes similar pains of moderate intensity, local tenderness, and meteorism, but no abdominal rigidity. There is constant gurgling in the ileocecal region, malena, spirochetes, or even tuberculosis bacilli in the feces. Early stages of tuberculosis of the

cecum will give a similar picture before the hypertrophic tumor develops.

Tuberculous lymphoma may cause chronic symptoms and is characterized by emaciation, hectic fever, night sweats, tuberculous glands elsewhere, and positive tuberculin reaction. The positive diagnosis of this condition can be made only by positive exclusion of the previously mentioned tuberculous diseases about the ileocecal region. The same symptoms may be caused by lymphoma in this region from any other cause, as retroperitoneal cysts, solid retrocecal tumors, or chronic psoas abscess. Flexion at the hip occurs in glandular enlargement around the cecum, appendix, or psoas muscle.

Tuberculosis or actinomycosis of the appendical or periappendical tissues must also be mentioned. Simple flatulence may produce this type of pain in an inflated cecum over which marked tympany may be obtained. Chronic constipation of the ascending type may also be a factor, as may dilatation of the cecum due to obstruction lower down. Finally, I wish to state that such pains may be a result of disease of any organ or tissue in the vicinity of the cecum, as well as of spinal disease or affection of the abdominal walls.

## Acute Pains in the Left Iliac Region

Pains in the left iliac region are much less frequent than pains in the right iliac region. They may be acute or chronic or may be an exacerbation in the course of a chronic disease. It is evident that organs or tissues which are located bilaterally may cause pain in either side, as, for example, the female genitalia, bones, joints, nerves, veins, or abdominal walls.

Our first thought in sudden, intense, colicky pains in the left iliac region is intestinal colic and rather an obstruction colic in the sigmoid than a simple intestinal colic. The most common cause for this obstruction colic is volvulus; incarceration is more rare. Such an acute onset may also be the first sign of a previously existing dormant stenosis. Local circumscribed tenderness over the sigmoid is of great importance in these cases, as the pain may be rather diffuse over the abdomen.

Such a pain, on the left side, even when accompanied by vomiting and symptoms of strangulation ileus, may be caused by nephrolithiasis on the same side. It will be especially difficult to diagnose the first attack of this condition when there is no previous history. I wish to point out

that pain in the left iliac region accompanied by pain in the left lumbar region which radiates to the testicle, penis, or labia is, of course, suggestive of renal or ureteral disease, but is not a pathognomonic sign for disease in these regions, as such diseases of the sigmoid as carcinoma or sigmoiditis may cause a similar radiation. Of greater importance is the fact that in renal disease the tenderness is more marked in the lumbar region than in the left iliac zone and is accompanied by hyperesthesia of the skin of the flank. Stone in the ureter will not cause this sign but will show tenderness along the ureter, namely, at a point of intersection of a horizontal line at the level of the navel and a perpendicular line at the external border of the rectus. Real tenderness of the testicle is important in renal or ureteral disease, as it does not occur in intestinal conditions. The same may be said to apply to red blood cells and albumin in the urine. Ureteral cathe~~ra~~eterization and X-ray will offer further aid in the diagnosis.

Periureteritis from ureteral stone may cause a necrosis of the walls and show intense pains, tenderness, mass in the left lower abdomen, fever, vomiting, even diarrhea, fixation of the left hip, and even resulting acute, fatal peritonitis. The presence of pus cells and albumin in the urine may be of some value in the diagnosis.

Another possible cause is phlebitis of the left iliac vein, which is followed by edema of the left

lower extremity, increased temperature, tenderness on palpation of the left crural vein, and even by a mass in the left iliac fossa. The causes of such a phlebitis are inflammatory conditions of the left lower limb, hemorrhoidal nodes, diseased tissue in the small pelvis or lower portion of the large intestines, and general infections as in typhoid or sepsis.

Parametritis may cause similar pains in the iliac regions with perhaps palpable mass to the left of the symphysis in the sigmoid region if the exudate extends upward. It is important to know that parasigmoiditis may result from a parametritis during the puerperium and is perhaps caused by constipation. The shape of a parametritic mass is like a wing with the tip pointing outwards, while the wing-shaped mass in perisigmoiditis does not have its tip pointing in this direction. Parametritis produces sacral pains and dysuria, while peritonitic symptoms like vomiting are often absent. The other gynecological findings and the fact that the mass may be bilateral will be of decisive value.

If the pain is not colicky but rather continuous with exacerbations and remissions and rather dull in character, we must think of sigmoiditis, either acute catarrhal, ulcerative, or phlegmonous in nature. The local tenderness, examination of the feces, sigmoidoscopy, and agglutination of the serum in dysentery will clear up the diagnosis.

When the pain is more intense we should think rather of perisigmoiditis, a condition less rare than is usually considered. Such a perisigmoiditis may be caused by a great variety of factors, as, for instance, marked constipation in pregnancy, ulceration of the sigmoid as in dysentery, carcinoma, diverticulæ of the sigmoid, foreign bodies, and metastatic spread from other places which are acutely affected, as, for instance, from a severe infectious bronchitis or extension from the appendix or female genitalia. The clinical picture of a perisigmoiditis consists of pains in the left iliac region which are intense, continuous, and occasionally radiating to the left lower extremity. There are epigastric pains in the early stages, prolonged fever, vomiting, constipation, sometimes diarrhea combined with tenesmus and often mucus, and more rarely blood in the stools. Locally we find left-sided tenderness on palpation and percussion, as well as rigidity in this region.

A distinct perisigmoiditic mass, which may be sausage-shaped and correspond to the shape of the sigmoid may form in a few days. Gurgling may sometimes be demonstrated in this mass. Such an exudate mass may regress or may form an abscess in the left pelvis, and it may also perforate spontaneously in the intestine, in which cases we find purulent and stinking stools. In view of the great number of variations which the sigmoid may assume we can easily see that the

clinical picture will also be variable; for instance, the mass may be placed horizontally and may be pear-shaped, thus assuming the position of the bladder. The perisigmoiditic mass need not always be palpable through the abdominal wall but may be found only on rectal or vaginal examination. The mucosa of the rectum or sigmoid may even be fixed by the exudate, a sign seen on digital examination. Endoscopy is also of value.

Of even greater frequency is periappendicitis, in which the symptoms are most marked in the left side. This may be due to complete or partial congenital malposition, displacement of the appendix by adhesions, a congenitally long appendix, or radiation or extension of the process to the left. The diagnosis will be made on remembering the possibility of such a condition, by finding that the objective signs are either most marked or more concentrated in the right side, and by absence of signs of sigmoiditis.

Another condition which is often not considered but which may cause pains on the left side is obstruction of the inferior mesenteric artery or vein. The obstruction of the inferior mesenteric artery as a rule causes a severe infarction of the intestinal wall and is followed by a fatal peritonitis. Such obstruction of the inferior mesenteric vessels does not produce such stormy symptoms, as these vessels have many collateral branches, and the process may thus even heal

spontaneously. Such a patient complains of a very sudden, intense, cramp-like, recurrent pain which lasts a few days. Collapse may appear, as may pain over the descending colon, tenesmus, and even pain in the transverse colon. Rigidity over the above-mentioned places may also be present, and there may be distention of the affected regions and part of the intestines below it. The latter is determined by inspection, rectal examination, and sigmoidoscopy.

The mucosa may appear velvety and loose. Fever and peritonitic symptoms are absent. Microscopic and occult blood in the stools will be of very great value, but there may sometimes be only occult bleeding with diarrhea. The diagnosis can hardly be made in the absence of blood in the stools, either microscopically or occult. We may think of such an obstruction in the presence of cardiac disease, especially of the heart wall, aorta, portal vein, pre-existing infectious processes of the intestine, general thrombophilia occurring in general infections as influenza, and primary nephritis or sclerosis of the interstitial blood vessels.

Iliac pain on the left side may be referred from the thorax. For a discussion of these the reader is referred to the previous remarks on this subject.

### Recurrent Pains in the Left Iliac Region

Our first consideration in the presence of this kind of pain should be some intestinal disease, especially the spastic conditions of the descending colon, which may be a symptom of a spastic constipation, mucous colitis, foreign bodies or parasites in the intestines, local infections, ulcers, adhesions, etc.

It may also be of reflex origin, as from kidney or gallbladder, or of central origin, as tabetic crisis, or functional, as in nicotinism or neurasthenia. Such a localized spasm of the colon will be characterized by recurrent colicky pains in the left iliac region, sometimes very intense and often nocturnal nausea, vomiting, constipation or retention of stools and flatus, and sometimes collapse. We may find local meteorism, and we may be able to palpate the descending colon and contracted flexure as a tender cylindrical mass. Papaverine and belladonna may cause relaxation, and the X-ray findings will also be of value.

Simple intestinal colics such as stercoral or flatus colics are seldom localized to this region. Subacute and chronic ulcerations of the large intestines occur, such as dysentery, ulcerative colitis, simple chronic ulcer of the sigmoid, and, occasionally, simple chronic ulcer of the small intestines.

Peritoneal adhesions in the left iliac region are of more importance as a cause of recurrent pain

in this area. I wish to emphasize the fact that peritoneal adhesions have certain favorite locations in the left as well as in the right iliac regions. Both these regions may harbor the later effects of any inflammatory process in the abdomen such as peritoneal exudate or any other condition transported to the iliac regions by the intestinal movements, gravity, and other causes. We therefore often find adhesions in these places, which adhesions may cause the recurrent pains, although the primary cause may be elsewhere, as in gastric ulcer, cholecystitis, periappendicitis, parametritis, and appendicitis in which pressure in the left iliac region usually causes pain in the right side. Trauma, perforation, and perhaps inflammations arising externally to the peritoneum may also cause these pains, as may stone in the left kidney or ureter. Recurrent pyelitis with recurrent pain and chills of several days' duration occurs very often during or after pregnancy. There are also constipation, meteorism, nausea, vomiting, and even slight abdominal rigidity in this condition, and the pains may extend high up to the lumbar region. Tenderness on percussion and hyperesthesia of the skin over the lumbar region are always present, but the positive urinary findings may be found only at intermittent periods.

Such adhesions cause recurrent pains, a sensation of fullness or pressure in the left lower abdo-

men, tenderness of this region, and emaciation. The latter may lead us to mistake the condition for malignant disease. The important point is the fact that the pain is greatly increased by movement of the bowels or upon bodily motion. The course is chronic, and the location of the symptoms is constant.

Stenosis from any cause must be suspected in the presence of intermittent colics. In carcinoma of the sigmoid we can occasionally palpate the tumor itself. When a mass is felt it is usually either the hypertrophic bowel proximal to the tumor or this segment filled with scybala.

Furthermore, it is important to remember that the sigmoid is the favorite place for volvulus. In this disease, we find very intense pains of several days' duration and not intermittent as in stenosis colic, but rather remittent in character. There is complete stoppage of the bowel for stool or flatus, and there are meteorism and nausea.

### Constant Sensation of Discomfort in the Left Iliac Region

The same conditions which caused similar symptoms in the right side may also cause the same complaints in the left. For a consideration of these the reader is referred to the chapter dealing with that subject.

In addition I wish to mention that chronic tuberculous perisigmoiditis may be the only local-

ization, either clinically or anatomically, of a tuberculous peritonitis. The patient complains of a constant discomfort in the left iliac region, dyspepsia of the stomach and intestines, often dysuria, and night sweats. Objectively, we find subfebrile temperature and a tender perisigmoid exudate mass on palpation or rectal examination. The differential diagnosis between a simple and a tuberculous perisigmoiditis will be made on the history and tuberculin reaction. In the simple type there are acute or severe pains in the beginning, while in the tuberculous type the onset is gradual and there may be tuberculosis in other places. Luetic perisigmoiditis and sigmoiditis may also cause this pain. Here the history, the presence of lues elsewhere, nocturnal occurrence, *Wassermann* reaction, and the effect of the treatment may be of value.

# Pains in the Lumbar Region, Flanks, and Lateral Parts of the Abdomen

## Lumbar Pains

In this chapter we will discuss pains in the real lumbar regions and not in the median or lateral portions of the body. When a patient complains of a sudden, severe, colicky, or crampy pain in the lumbar region our first thought is, of course, of some involvement of the renal region.

Among the many conditions of the urinary system which may cause such pains are stones in the kidney or ureter. In ureteral stone the pain is localized rather to the side of the flank part of the abdomen. Oxalate stones produce the severest pains, while phosphatic stones produce a more constant pain with transient exacerbations. Urate stones produce comparatively mild pains. It is not necessary to consider that a large stone is the only causative factor in colic and hematuria, as a small sharp crystal such as oxalate may cause similar results.

Renal colics are characterized by the unilateral distribution, which distribution does not necessarily correspond to the location of the stone, as a stone on one side may cause pain on the

other by the renorenal reflex, while there may be no pain at all on the affected side. The pains typically radiate down the ureter to the bladder, testicle, penis, labia or vagina. We also find radiation down the lateral and anterior surface of the thigh. Radiation towards the shoulder is exceptional. The pains remain for hours or days, sometimes with slight remissions. The pains are often influenced by external factors, such as shaking up of the body or the taking of acid foods or drinks. They are sometimes relieved by elevation of the pelvis, chills are often observed in the beginning, and fever is absent when there are no complications. Reflex vomiting occurs but is without any effect on the pains. There may be complete stoppage of stools and flatus; painful meteorism, which may be partially relieved by passage of flatus which may be present. Rectal tenesmus, retention of urine, or desire to urinate frequently, even when the radiating pains do not reach the bladder, may also be found. The attack may end abruptly.

Objectively we find hyperesthesia of the skin in the lumbar region and tenderness on pressure in the flanks and lumbar regions, especially at the twelfth rib; the kidney, ureter, and surrounding tissues may be tender on bimanual palpation, while tenderness on percussion of the renal region is often marked but may also be absent. The testicle or ovary on the same

side is tender. The former may be drawn up by reflex contraction of the cremasteric muscle, there is unilateral lumbar rigidity on the diseased side, and the region of the iliohypogastric nerve shows lessened sensibility, or it may even be anæsthetic. The urine may be diminished and concentrated during the attack, while the quantity is greatly increased after the attack has passed. The urine is highly acid and there are traces of albumin and occasionally microscopic hematuria, but there are at least a few laked blood cells in the centrifuged sediment unless there is a complete obstruction of the ureter, a condition which occurs especially after shaking up of the body, as after riding, etc. There is sometimes a large amount of urate or oxalate crystals or gravel in the urine.

An affection which may resemble the condition just described is tuberculosis of the urogenital system. Tuberculosis of the kidney may cause exactly the same kind of attacks as renal stone when there are clumps of pus, blood clots, or cheesy particles. Acute congestion of the kidney or tension of the capsule in renal tuberculosis may also produce colicky pains in the lumbar region but usually without radiation. The urine may be absolutely clear in these cases, and only animal inoculation for the presence of tuberculosis bacilli and cystoscopic examination may clear up the diagnosis.

When hematuria is present the sequence of the symptoms is of a certain importance, as in renal stone the hematuria follows the colic, while in tuberculosis the reverse is true. Furthermore, tenderness of the testicle speaks rather for renal stone. In cases in which the urine is cloudy or intermittently so, and acid in reaction, we must suspect tuberculosis of the kidney even when there are no subjective complaints and the general condition is good. A few red cells are present in the urine even if there are no other abnormal contents; in other cases a cloudiness caused by pus cells or thin threads of blood in the urine is present. Cultures of this urine on the ordinary media will be sterile in spite of the many pus cells which are present, and tuberculosis bacilli may be found, but should be controlled by animal inoculation, as the smegma bacillus may be very easily mistaken for it. X-ray, cystoscopy, and ureteral examination will be of great importance.

The patients may complain of only slight dysuria or frequent urination at night, or may even show no symptoms at all. Slight subfebrile temperature may be present, as well as loss of weight and lowered blood pressure. The diseased kidney may be enlarged and tender, but we must remember that the opposite kidney may be tender and swollen as a result of compensatory enlargement. It is also of great importance to examine the ureter for thickening of the genital organs for

tuberculous changes. The tuberculin reaction is of some value but may be misleading, as tuberculosis and stone in the kidney is not a rare combination.

The mere finding of a renal stone should not satisfy us, as we must determine the pathological condition of the kidney itself, really the important thing. We must remember that tuberculosis may be present with a stone, and that a uric acid stone is often associated with a gouty diathesis, and also that a renal colic with radiation may occur in gouty diathesis even in the absence of a stone, being caused by a deposit of uric acid in the kidney. Congestion of the kidney and tension of the capsule may be the cause of pain in the former condition. As a matter of fact, this congestion and tension may cause renal colic when they arise from any reason whatsoever.

Less common causes of lumbar pain than stone and tuberculosis are certain types of nephritis. The first is the acute hemorrhagic nephritis in which the acute and rapid congestion of the kidney, tension of the capsule and possibly angioneurotic spasms, may lead to repeated attacks of colics with short intervals. Radiation of the pain to the testicle may be present, but the pains do not radiate along the ureter. The diagnosis in the majority of cases will be based on the bilateral character of the pains and hematuria. The hematuria may be profuse or there may be only some

red blood cells and casts in the urine. In contradistinction to renal stone, the red blood cells in the urine and the hemoglobinuria will be present also during the intervals between the attacks. The differential diagnosis will be especially difficult if it is localized to only one kidney, as undoubtedly does occur. The presence of the acute edema, due to the nephritic changes, and X-ray ureteroscopic examination will be decisive. There is a type of nephritis, nephritis dolorosa, in which unilateral attacks of pain are observed. We find oliguria or anuria and disturbances of the kidney function in these cases.

The differentiation or periappendicitis with red blood cells in the urine has been given elsewhere.

Chronic colicky nephritis may cause intense, typical renal colics with radiation to the testicle, without previous symptoms or blood in the urine, and with no changes in the urine except traces of albumin, a few red cells, and some granular casts. The acute edema of the kidney with resulting tension of the capsule may be responsible for the pains. The diagnosis is made by exclusion of all other diseases.

Ordinary chronic nephritis may occasionally show typical colic, even combined with fever, and is produced by intermittent renal congestion or by passage of blood clots.

Acute renal congestion in malaria and renotyphoid, which is a form of typhoid appearing

as an acute hemorrhagic or non-hemorrhagic nephritis, may also have to be mentioned. The pains in these conditions are, as a rule, dull and may set in suddenly in both lumbar regions with colic. Similar symptoms may be present in general sepsis with colon bacilli.

Congenital cystic kidney may often produce symptoms later in life without previously causing any trouble. These patients usually show the typical picture of chronic interstitial nephritis with cardiac hypertrophy, increased blood pressure, even uremia, and sometimes colicky lumbar pains with hematuria. The proof lies in finding a large bilateral mass which feels like a bunch of grapes and which corresponds to the kidneys. There may be cysts in the liver or testicles.

Another rare condition to be mentioned is the so-called perirenal hydrophrosis or an accumulation of serous fluid between the renal cortex and the tunica fibrosa.

Acute pyelitis causes colicky pains in the lumbar region but is without radiation along the ureter. This occurs especially in pregnancy and shows the intermittent colicky pains, chills and fever, or fever without pains. There are also intermittent cloudy urine which is acid in reaction, intermittent leucocyturia, epithelia and bacteria in the urine, sometimes polyuria, and occasionally $H_2S$ in the urine. Deep percussion over the kidney causes pain, in contrast to peri-

renal inflammation, in which condition this sign is always present. There is hyperesthesia of the skin in the lumbar region and tenderness of the anterior wall of the abdomen over the region of the renal pelvis, the kidney may be palpable as a tender tumor, the right side of the diaphragm remains high, respiration is painful, and symptoms of general sepsis with vomiting may appear. Caked pus in purulent pyelitis may also be a cause for colic. This pyelitis may or may not be tuberculous in nature.

Hydronephrosis may cause these pains in several ways. A distended hydronephrotic sac, after emptying, may quickly fill up again and thus cause pain by a too abrupt refilling. Another cause is a change from an open to a closed hydronephrosis, namely, from one in which there is a communication with the ureter to one in which the ureteral exit becomes blocked. Intermittent hydronephrosis may be caused by a tumor of the renal pelvis or of the kidney itself, in which cases the pains appear when the body is in a certain position, as for instance, in the upright position, only to disappear when the position is changed.

A tumor of the kidney may cause pain in several ways; there may be bleeding in the tumor tissue, blood clots in the ureter, extension of the tumor in the renal vein followed by thrombosis of the latter, distention of the pelvis either by the tumor itself or by its bleeding into the pelvis,

particles of the tumor in the ureter, congestion of the tissue which has a rich blood supply, followed by a stretching or even rupture of the capsule, metastasis in the opposite kidney, or a possible combination with stone or tuberculosis.

Echinococcus of the kidney with rupture into the pelvis and wandering of the daughter cysts, repeated ureteral colics with perhaps previous finding of a cystic tumor in the renal region, which later shows appreciable decrease in size with milky or soapy urine containing cysts, hooklets, or parts of the membranes may cause these pains. The appearance of an urticaria with the initial attack is a valuable sign, as are eosinophilia and the serological findings.

Repeated embolic infarcts followed by fibrous paranephritis may produce recurrent, intense pains in the lumbar region especially in the region of the iliohypogastric nerve. These attacks are not unlike the real colic of kidney stone. We also find constant, dull pain in the lumbar region in these cases, which is increased on bodily motion or after hematuria. Radiation of the pain along the ureter does not occur. The presence of a possible cause for such an infarct, as in aortic insufficiency, must also be looked for.

Fibrous adhesions between the kidney and other parts may cause colicky pains in the lumbar region, especially in neurotic people. The diagnosis can be made with some probability when

there is a causative factor such as luetic paranephritis, actinomycosis, or any inflammatory condition of the kidney or surrounding tissue or organs.

Primary disease of the ureter is usually accompanied by pain which is located in a more lateral position than in kidney lesions and is distributed along the course of the ureter, but in some cases it may also cause lumbar pains which may be more severe in the back and may even radiate along the spermatic vessels to the testicle.

In the first place, we must mention real stenosis colics of the ureter which may be caused by the factors already mentioned and in addition by scars resulting from ulcerations of a stone. The diagnosis will be made on the X-ray findings, cystoscopy, and urinary and ureteral examination.

Tuberculosis of the ureter can hardly be diagnosed with certainty. We may suspect such a condition if we can palpate the ureter as a thick cylindrical strand either by abdominal, vaginal, or rectal examination. Cystoscopy may reveal tuberculous lesions at the orifices of the ureters. We must remember that a tuberculosis in the renal pelvis may be the source of caseous masses which, on passing down the ureter, cause severe colic, although the ureter itself is not diseased.

Ureteritis membranacia may produce such pains during the passage of pieces of the mem-

brane down the ureter. The urine may contain such pieces. This condition may occur in fibrinous ureteritis with passage of fibrin clots, the fibrin may be precipitated from the blood after a trauma, or the membrane may be of mucus or diptheritic character.

Chyluria is associated with similar symptoms and signs. It may also be symptomatic as in tuberculosis of the urogenital system, or it may be an extension from the renal pelvis as in leucoplakia or pseudomembranous inflammation of the pelvis. In the first condition we find white mother-of-pearl-like membranes with silicate crystals, while in the pseudomembranous type the urine contains masses of fibrin, uric acid crystals and B. coli.

Torsion or kinking of the ureter may cause severe pains, probably as a result of twisting of the renal vessels and nerves. The picture may be severe or may resemble ileus, but there are also comparatively mild cases. We find severe ureteral colics with marked oliguria and sometimes reflex or mechanical anuria with increased urinary output after the attack. Red cells, albumin, and leucocytes may be present, and the urine may be concentrated. There may be an increased output of urine after the reflex anuria just described with resulting hydronephrosis or intermittent hydronephrosis if the torsion or kinking still persists. We will have to bear this possibility in

mind in the presence of a wandering kidney. Before diagnosing such a kinking or torsion in a wandering kidney we must first rule out a primary disease of this organ as a cause for the pain. In this connection it is important to remember that if the pain disappears after replacement of the kidney and assumption of the dorsal position the condition is probably some primary disease rather than a torsion or kinking of the ureter. It must also be remembered that combinations of primary renal disease with torsion of the ureter are not rare. Abnormal course of the ureter due to congenital displacement may also cause such pains.

The pains under discussion may also be caused by compression or distortion of the ureter from the outside. The most frequent of these conditions is inoperable carcinoma of the uterus with ensheathing of the ureters in the carcinomatous mass. Such a carcinoma extending into the bladder, or even a primary bladder carcinoma, may cause such compression near the entrance of the ureters into the bladder. Tumor of the glands near the ureters may also cause compression, as may tumors or abscess of the bones, aortic aneurism, or chronic inflammatory or fibrous processes around the ureter, the so-called periureteritis exudativa or adhesiva which may occur after an appendicitis.

Our first thought in the presence of lumbar

pains occurring in a patient with bladder disease is of an ascending infection. Such lumbar pains may occur by the vesicorenal reflex in strictly localized bladder, prostatic, or posterior urethra disease. We find such a condition in stone or tumor of the bladder, in passage of clots of any kind through the urethra, or in chyluria. The fact that these pains are bilateral may draw our attention to the bladder, while the urinary findings such as alkaline reaction and mucus in abnormal quantities will be of importance. We must not forget that acid urine is not rare in cystitis and that alkaline urine may be found in pyelitis. Mucus in the urine occurs chiefly in cystitis but may also be present in pyelitis or rupture of a congenitally cystic kidney into its pelvis.

Acute prostatitis or an acute exacerbation of a gonorrheal prostatitis may also cause lumbar pains, which may be unilateral, produce hyperesthesia of the skin, and tenderness on fistic percussion in the lumbar region. This condition may remain for several days and may even be accompanied by chills and fever. The local prostatic findings and the effect of treatment directed to this part will clear up the diagnosis. Stones in the seminal vesicles may very closely resemble the attacks seen in renal calculus.

Among the extraurogenital conditions which may imitate renal colic are cholelithiasis, acute cholecystitis, and hepatic disease. The patients

may complain of pain to the right of the spine, in the neighborhood of the lumbar region instead of in the usual location for this pain. There are also patients suffering from gallbladder or gallstone disease in whom the pain appears repeatedly in the left lumbar region. This abnormal location may be due to atypical radiation, spasm of the colon, or hyperemia of the left kidney. The pains may remain circumscribed or may radiate towards the liver. The diagnosis during the attack will be based on the findings of gallbladder or gallstone disease as already described and on the negative urinary findings. Pain during respiration points to liver colic in a limited way, but this sometimes also occurs in renal conditions.

The diagnosis during an attack will be very difficult, as pains from renal stones may occasionally radiate to the right shoulder. The findings on palpation, the urinary findings which occur in liver colic, and the nocturnal occurrence of the attacks will speak for liver colic. Increase of the pain on bodily motion speaks rather for renal stone. Hyperesthesia of the skin in the lumbar region in cases of gallstones is located above the twelfth rib, seldom going down so low, while in renal stone the hyperesthesia reaches its highest point in the region of the tip of the twelfth rib and extends lower down. Hyperesthesia of the skin in the anterior part of the

abdomen is present in cholelithiasis but is absent in renal stone.

We must not forget that renal colic may coexist with genuine liver colic or with pains arising from other organs of the digestive tract. We can make the diagnosis only by a consideration of all the above-mentioned points.

Right-sided lumbar pain in duodenal disease is not so rare as is usually considered; in fact it is well to bear in mind the possibility of duodenal ulcer as a cause for pain in this region. The rigidity, tenderness on percussion in the right upper abdomen, and the other signs of duodenal ulcer will clear up the diagnosis.

Acute yellow atrophy may also cause pain posteriorly or even near the lumbar region. Acute affection of the hepatic flexure or, more commonly, of the splenix flexure, such as pericolitis or sudden stenosis, may lead to colicky lumbar pains.

We must also consider renal neuralgia, either from malaria, renal crisis of tabes, or hysteria, or in conditions not at all involving the nervous system but which are accompanied by hematuria, as in nephralgie hematurique. The malarial neuralgia will be characterized by its periodic course and perhaps hematuria. In tabes the very intense colicky pains may radiate along the ureters into the bladder and urethra. Nephralgie hematurique is not a distinct condition and can hardly

be diagnosed with certainty. The complaints due to a wandering kidney in hysterical patients may be greatly exaggerated. Pains in the renal region are also commonly present in sexual neurasthenia, spermatorrhea, and nervous impotence. Here we find sacral pains radiating to the thighs and rectal pains radiating to the renal region, or even isolated pains in the latter place.

Chronic lead poisoning may occasionally set in with pain in the lumbar regions, radiating to the thighs, and the colic is localized around the navel only later in the course. This abnormal location of the pain may be due to particular involvement of the renal vessels. Lead gout may occur in these cases and produce renal colics, or the condition may result from a chronic lead intoxication.

### Acute Continuous Pain in the Lumbar Region

When a patient complains of a sudden pain in the renal region which is continuous for a few days and is boring, pressing, or sticking in character, but not colicky, and disappears after some time, we must think of a renal infarct, especially if there is a disease present which may cause such an infarct. The conditions which are especially likely to cause such an infarct are mitral stenosis, aortic insufficiency, and, less often, changes in the heart, aorta, or pulmonary veins or thrombosis of a peripheral vein with an open foramen ovale in the heart. The pains in renal infarct

are sometimes combined with chills and vomiting and are usually circumscribed, with no radiation or only slight radiation to the thigh. We find tenderness on percussion and pressure in the flanks and lumbar region as well as hyperesthesia of the skin in these places. The patient suffers from dysuria or he has a slight urinary incontinence. An abnormally frequent desire to urinate is usually absent. The urine may contain excessive albumin, perhaps twenty per cent., which may quickly disappear. There is almost always nephritic sediment and hematuria, although they may be demonstrable only microscopically. The finding of blood pigment in the urine is of some importance; it may even be intracellular. Fever of a few days' duration speaks rather for an infarct than for renal stone. The blood pressure is not increased, in spite of the pain.

Sudden, continuous pain may also be caused by an acute nephritis, less often by an exacerbation of a chronic nephritis. Other causes are renal abscess, either single or multiple, which are caused by trauma or hematogenous infection, acute pyelitis, and suppurated hydro- or pyonephrosis. In all these conditions the pains are localized strictly to the lumbar region and not the flanks. The local tenderness on percussion or pressure, as well as the skin tenderness, are chiefly localized to the lumbar region and are hardly at

all present in the flanks. The tenderness may be more pronounced in the anterior abdominal wall over the renal pelvis than in the flanks. There may be positive findings on palpation in some cases. The objective findings in the urine will be positive in nephritis, while the urinary changes may be easily overlooked in pyelitis, and a diagnosis of lumbago may be erroneously made. There may be only traces of albumin, a few polynuclear leucocytes, some laked red blood cells, and uric acid crystals in the urine. Pyuria will, of course, be well developed in pyelitis of a severe grade when a renal abscess bursts in the pelvis, but in the absence of such an abscess's bursting in the renal pelvis there will be only microscopical pyuria.

The simple, active hyperemia which may occur in acute infectious diseases or during an acute exacerbation of a chronic infection will be followed by only mild pains in the lumbar region. Traces of albumin and a few red cells in the sediment may be present.

Similar moderate lumbar pains may also be due to hydroureter. The rupture of a hydronephrotic sac in the retroperitoneal tissues with urinary infection may cause a sudden, very intense pain in the lumbar regions and flanks, meteorism, vomiting, singultus, no passage of stool or flatus, reflex muscular rigidity, and very severe local tenderness, the entire picture resembling that of

pseudoperitonitis. Such a rupture of a hydronephrotic sac may occur spontaneously or as a result of a trauma with some blunt object. The differentiation of such a rupture from intraperitoneal affections will be very difficult. The knowledge of a previously existing, movable, fluctuating tumor in the flanks, with ballottement and anuria and the finding of hematuria, slight fever, and increased pulse rate may support the diagnosis. It may be added that such a rupture of the renal pelvis need not be preceded by a hydronephrosis but may be due to erosion of the kidney pelvis by a renal stone.

Acute posterior paranephritis may be associated with pains in the lumbar region. The severity of the pains increases for a few days and then remains very severe. Fever, repeated chills, and a general septic condition occur in purulent paranephritis. A single initial chill may also occur in non-purulent paranephritis. We find a very marked tenderness on pressure and percussion in the region of the twelfth rib, the pains are strikingly increased on bodily motion, and the spine is rigid. The lumbar muscles on the affected side are rigid, the psoas may be contracted, and there may be a local swelling or edema of the skin and sometimes deep fluctuation. The urine may be negative or may contain a few laked red cells and bacteria. Similar symptoms may be found in psoas abscess, or this abscess may per-

forate in the paranephritic tissues and cause the symptoms just described.

Hemoglobinuria may be associated with lumbar pains which are, as a rule, rather moderate. The patients with paroxysmal hemoglobinuria often complain of moderate pains in the lumbar region and sometimes of a burning or tearing sensation in this region; occasionally the pain may resemble that of renal colic. We find marked tenderness in the lumbar region in the latter type and only moderate tenderness in the usual form. Headache and muscular pains may also be present during an attack. The history of a provocative factor, urinary findings, diminished resistance of the red cells to hypotonic solutions, and reaction to the *Donath-Landsteiner* test will support the diagnosis.

Similar complaints may be present in hemoglobinuria due to other causes, such as after blood transfusion and blackwater fever, or may occur in the course of acute infectious diseases. The above-mentioned causes which may produce hemoglobinuria may also produce signs of renal involvement such as moderate albuminuria, genuine casts, etc. These may be temporary or permanent and may occur in the infectious diseases such as septic angina, etc.

Hematoporphyrinuria from any cause may also be followed by lumbar pains and pains in the bladder region above the symphysis. The

diagnosis will be made on the reddish-black color of the urine and on its chemical and spectroscopic characteristics. Hematuria may appear as the only sign of hemophilia and may be accompanied by severe, sharp lumbar pains.

Similar bilateral lumbar pains have been observed in parasitic chyluria. The diagnosis will be based on the history, eosinophilia, filaria in the blood, fibrinous clots in the urine, and milky aspect and the presence of albumin and many fat droplets in the urine.

Inflammation of the retroperitoneal tissues, even if purulent, produces pains which are usually dull in character. These inflammations may arise from inflammation of the organs in the lower abdomen or pelvis and lower extremities, and only exceptionally from organs above the diaphragm or within the peritoneum. The diagnosis of this condition will be made on the general symptoms of suppuration or inflammation, such as irregular fever, clouding of the sensorium, moderate cyanosis, moderate increase of the pulse rate to about one hundred, with some irregularity, moistness of the tongue, and absence of abdominal tenderness or rigidity of the psoas. Marked meteorism, due to intestinal paresis, may be present in spite of the fact that good results are obtained with an enema. We find local edema of the lumbar skin, with occasional bulging in this region. There is often local tenderness on per-

cussion or pressure, which tenderness extends from the eleventh rib to the ilium, in contradistinction to the renal tenderness, which is more or less localized to the region of the twelfth rib.

Other causes of such lumbar pain are subphrenic suppuration or abscess of the liver, spleen, other organs near the pancreas, or the pancreas itself. These pains may also be present in pancreatic necrosis if a walled-off abscess develops in the left lumbar region. An abscess of the head of the pancreas not infrequently leads to a gravitation abscess which reaches between the gall-bladder and right kidney and leads to an acute anterior paranephritis. Acute adrenal disease may also cause lumbar pains. In all the conditions mentioned in this paragraph the pains may be dull or very severe.

When a patient complains of sudden, intense pain in the lumbar region, especially on the left side, we must think of a possible angina pectoris subdiaphragmatica. The lumbar pains are usually a radiation from the chest. The diagnosis will be made on considering the origin of the pains, the general features of an attack of angina pectoris which may be present, and the findings of arteriosclerosis. There are, however, cases in which the pains in the lumbar region predominate or are limited to this region and which may radiate even to the testicle or thigh.

Acute diaphragmatic pleurisy may also cause

lumbar pains and vomiting, but will be differentiated by the presence of dyspnea, singultus, typical tender points of the phrenic nerve, and negative findings in the internal organs. Acute empyema, pneumonia, and chronic adhesive pleurisy may cause similar pain, even with hyperesthesia of the skin in the lumbar segments. This localization may be due to radiation or to involvement of the intercostal nerves or compression of them in cases of chronic pleurisy with contracted adhesions.

Appendicitis and periappendicitis may cause lumbar pains in several ways. This may be due to an abnormal location of the appendix towards the lumbar region or to an ascending paranephritis which extends from a retrocecal periappendicitis via the lymphatics to the cellular tissue. This paranephritis may even be the first symptom of an appendicitis which has apparently remained dormant up to this time. The left lumbar region may become involved in these cases by a wandering of the process either along the diaphragm or pelvis. Paranephritic symptoms may, however, be present on the right side without any apparent anatomical change about the kidney. In some cases of appendicitis we find renal signs and red blood cells in the urine which are due to an ascending infection of the ureter and kidney from the appendix. These symptoms of hemorrhagic nephritis may clear up after the

appendix is removed. An appendical abscess may compress the ureter or may perforate into the latter.

Parametritic inflammation may extend upwards in the same manner as in periappendicitis and may also lead to perinephritic symptoms. We must also remember the possibility of hemorrhage into the perirenal tissues, as in the form which occurs in periarteritis nodosa or in adrenal insufficiency of the acute type. The periarteritis nodosa will also show a general picture of an acute infection with sweats, fever, marked pains in the limbs, sudden lumbar pains, and hematuria. Small aneurismatic nodules may be felt in the superficial arteries, especially in the intercostal muscles.

We must also consider thrombophlebitis of the renal veins or vena cava when we are presented by sudden, intense lumbar pains. Affection of the vena cava may be luetic in origin and may clear up under specific treatment. Other causes for lumbar pain which may even have an acute onset are abscess of the muscles of the back or of the lumbar spine itself. The fixation of the spine, X-ray, and careful local examination will lead to a diagnosis. We must not forget that the cause may be in lesions of the cord, its coverings, or spinal nerves.

In addition to the before-mentioned causes, we must mention the simple lumbago. This may be

unilateral or bilateral and may set in with acute lumbar pain or fever. The pains may be so severe that this condition and real stone may be confused. Lumbago is often a symptom of a general gouty condition, less often of a trauma or myalgia. Of importance in the diagnosis of lumbago is the fact that the pain is closely associated with all bodily motion, especially in bending over and straightening up, but may also be present upon mere shifting about in bed. The pains are present on walking or standing and nearly always disappear upon lying down. There is marked tenderness in the back and lumbar muscles. The tenderness in the traumatic type is due chiefly to tearing or bleeding, the tenderness being localized to one spot. The tenderness of the muscle will be especially marked if the muscle is contracted. This contraction of the lumbar muscle also occurs in renal stone, and the tenderness in this condition may be so great that the renal affection may be easily mistaken for lumbago if the rigidity is also marked. There may also be hyperalgesia in lumbago — a sign especially brought out with the Faradic current. Faradization of the muscle itself, however, produces a favorable influence. The pains are not colicky and do not radiate, nor are there urinary changes or reflex symptoms from the gastrointestinal tract. Constipation may be present but is due chiefly to fear of pain.

Neuralgia of the posterior branches of the lumbar plexus may also cause lumbar pain. These pains are usually dull, with intermittent exacerbations, but they are sometimes quite intense, with radiation to the gluteal region. The pains are increased on walking, standing, or straightening up. Typical tender points are present somewhat externally to the first three lumbar vertebræ and also at the middle of the iliac crests. Herpes zoster may occasionally appear in the affected area. There is often a combination with a similar process of the anterior branches. The pains in these cases may also radiate to the lower part of the abdomen, pubic region, external genitalia, and sometimes the inguinal region of the thigh. The typical tender points for this condition are found at a point somewhat above the external inguinal ring and another at the middle of *Poupart's* ligament. The testicle or labia may also be tender, and herpes zoster may be present in the inguinal region.

There is a combination of lumbago with lumbar neuralgia or sciatica. This is important to remember because some authors consider this combination as a neuralgia alone. In making such a diagnosis of neuralgia, we must try to determine the cause, especially if it is a genuine type such as occurs in metabolic conditions, infectious diseases or after a "cold." The disease may be only symptomatic and may be due to com-

pression of the nerves by inflammatory or neoplastic conditions of the meninges, spinal cord, or retroperitoneal organs. The neuralgia may be the only symptom of an underlying disease and may set in either suddenly or gradually. The primary type may lead to a reflex rigidity of the lumbar muscles. The typical tender points are absent in the symptomatic variety, but there is a radiation along the nerves, and even though the pains may be bilateral because the lesion is central, the intensity is greater on one side than on the other. The pains are increased on bodily motion, and they often disappear when the patient is in a certain position. The spine becomes rigid when the patient moves about.

The girdle pains of tabes may be localized to the lumbar region and give rise to tabetic pseudoneuralgia. These pains are often combined with tabetic, gastric, or intestinal crises. The tabetic neuralgia may be intermittent with intervals of complete relief, or there may be only a constant dull pain with acute exacerbations.

The lumbar pains in the acute infectious diseases may perhaps be explained by hyperemia of the meninges of the cord or myalgia, and are usually found rather low down near the sacrum.

Disease of the bones, as of the vertebræ or ribs, may also cause lumbar pains, but their origin in these cases will be recognized by the local findings and X-ray.

## Chronic Recurrent Lumbar Pain

When a patient complains of recurrent colicky pains in the lumbar region or flanks, we must consider those conditions already mentioned, as they may all recur several times. In short, the recurrent attacks in the urinary system will reappear if the original cause is still present and the colicky efforts have been insufficient to eliminate this cause, or when the cause itself recurs.

In pains in the left side we must also consider chronic or recurrent stenosis of the intestine due to organic or functional causes. The diagnosis will be easy if we see a marked stiffening or peristalsis of the intestine. The short duration of the individual attacks, lasting but a few minutes, will distinguish the intestinal from the renal colic; in the latter condition the individual attacks are much longer, lasting even hours, with undiminished severity. The sonorous tympany on percussion in the corresponding region, characteristic stool, and X-ray will aid in the diagnosis.

Gastric ulcer with or without pyloric stenosis may produce only lumbar pains, which are usually on the left side. There is often an accompanying epigastric pain, but the lumbar pains alone may be present.

Periappendicitis, especially when due to a re-

trocecal appendicitis, must also be considered. This condition may produce pains exactly resembling kidney colic or lumbar neuralgia, or constant pressing pain in the lumbar region.

In the presence of moderate, recurrent, drawing pains in both lumbar regions, we must think of a paroxysmal hemoglobinuria. These pains often appear as a premonitory symptom of an impending attack. These premonitory symptoms may also appear in the rudimentary cases in which there is only paroxysmal albuminuria and which only occasionally show its true hemoglobinuric character by the appearance of hemoglobin in the urine.

Recurrent pains not of a colicky nature may be a symptom of recurring hemorrhage into the perirenal tissue or in *Addison's* disease.

We must also think of an aneurism of the abdominal aorta as a cause of lumbar pains on the left side. Pains on the right side are more rare. These pains may radiate in a girdle-like manner towards the thigh or to the testicle. The pains may be colicky, are increased on walking, and are diminished while in certain stooping positions.

The diagnosis will be based on the presence of an expansile tumor, abnormal murmurs, and retardation of the radial and femoral pulse as timed with the apex beat. Simple luetic abdominal aortitis, really the basis upon which an

aneurism develops, may cause recurrent, colicky, intense pains in the left lumbar region. These pains may show a tendency to radiate towards the chest, and only when they are very intense will there be any abdominal radiation. The pains are provoked by bodily motion, may show a nocturnal tendency, and may remain for hours without intermission. We may find a marked pulsation and murmur over the aorta when the patient is lying down or when he is in the upright position. Aneurism of the lower part of the thoracic aorta may also cause lumbar pains if the diaphragm is pushed down. These pains are also on the left side.

Vascular changes in the renal vessels may cause colicky pains in the lumbar region with or without hematuria. The same changes in the vessels supplying the muscles of the back may also cause such pains and perhaps in the same way as in intermittent claudication. These muscular pains appear after the patient has been walking for a considerable length of time and may even become painful muscle cramps, or they may be combined with a sensation of weakness or stiffness in these muscles. The pain stops suddenly when these muscles are relapsed, as, for example, when the patient leans against a wall.

Primary or secondary diseases of the bones have the striking peculiarity of producing chronic, recurrent, lumbar pains, with intervals

of complete relief lasting several days or weeks.

Finally, I wish to mention that lumbar pains may occur in women during menstruation. This is due to congestion of the kidneys which results from the uterine congestion at this time.

### Chronic, Continuous Lumbar Pain

The first group to be considered is the urogenital system. Chronic nephritis or orthostatic albuminuria may occasionally cause moderate or vague sensations of pressure in the lumbar regions which may be somewhat increased in severity by the intake of large quantities of fluid. Intense pain is a rare finding in chronic nephritis; when it is present together with signs of chronic interstitial nephritis and hypertrophy of the heart, I am more inclined to suspect the presence of a congenital cystic kidney than of a plain chronic nephritis.

Continuous, moderate, or very severe pains are found in pyelitis, hydro- and pyronephrosis, renal tuberculosis, chronic suppuration of this organ, ecchinococcus of the kidney, and especially renal tumor. Such continuous pains with blood in the urine should always awaken our suspicion of a tumor of the kidney. These pains may also radiate to the gluteal region or to the thigh. The pains remain even if the patient is at rest and are especially severe when the neoplasm has perforated through the capsule and has involved the

surrounding tissues. The tumor may be primary, in which case it is usually a hypernephroma and one in which the cachexia may appear only later in the course, or the growth may be secondary, as from the testicle, prostate, uterus, stomach, breast, or thyroid gland. The pains are most intense in cases of secondary neoplasm, and the radiation may be along the sacrum or posterior surface of the lower extremity or even along the ureter to the bladder. There is only one other condition which may produce pains of such severity and constancy in the lumbar region; this is metastasis in the retroperitoneal glands. Neoplasms cause considerable hemorrhages, and particles of the tumor may be found in the urine in rare cases.

Tuberculosis of the kidneys usually causes dull pain in one or both lumbar regions, but the pains may also be sharp if there is an accompanying paranephritis. In some cases of tuberculosis of the kidneys the pain is increased upon the patient's lying down in a warm bed and not as the result of bodily motion. We may find abnormal irritability of the bladder, such as frequent urination or polyuria, and intermittent cloudiness of the urine. Fever, hematuria, pus cells in the urine, and the other symptoms already mentioned may be present.

The stones or deposits which lie in the renal tissue and which are incapable of being moved

are the ones which cause continuous pains. There are also various intestinal disturbances in this form of renal disease, such as constipation, flatulence, and meteorism. The pains are decreased on the patient's lying down and are particularly increased when the body is being jolted, as in riding over a rough road, making quick movements or jumping. There may be microscopic hematuria and traces of albumin during these transitory attacks, and the urinary findings may again disappear when the pain is gone. The local symptoms are already described and the X-ray will differentiate this condition from inflammation of the kidney, pyronephrosis, neoplasm, and tuberculosis.

Constant lumbar pain which may change in severity and which is more common on the right side may be caused by a movable kidney or nephroptosis. I do not believe that the movable kidney itself can cause such symptoms, but that the pain is due to very slight torsion of the ureter with resulting urinary stasis leading to increased tension of the capsule. It may also be due to the hypersensitiveness of the neurotic patient.

Chronic scar-like paranephritis, such as occurs in multiple infarcts of the kidney in aortic insufficiency, less commonly after traumatic hematoma or stone, may also cause such pains. These pains may radiate along the ureter to the hypogastric region and are increased on motion and decreased

when the patient lies down, especially on his abdomen. There may be various grades of hematuria, or the urine may remain normal. Chronic nephritis may also be a cause of paranephritis. Here we usually find constant, intense, unilateral pain in the lumbar region, radiating especially downwards to the thigh or bladder. We find a constant microscopic hematuria and an intense hematuria at the height of the attack.

Two rare conditions causing lumbar pains are aneurism of the renal artery and chronic suppurative actinomycotic paranephritis. The first condition is characterized by constant lumbar pain, a tumor in this region with indefinite pulsation, and hematuria which is often intermittent. We shall especially consider this condition if a pulsating tumor with intermittent hematuria appears after a trauma. Actinomycosis is characterized by an infiltration of the skin over the painful lumbar region, followed by softening and fistula formation and the presence of the causative organism. We must also consider a possible vesicorenal reflex from diseases of a stenosing character in the genitourinary canal. Affections of the retroperitoneal glands may also cause continuous lumbar pains. These gland affections may be primary, as in lymphosarcoma, or they may be secondarily involved by metastasis. The pains are constant but vary in intensity in different cases and may be the only symptoms of the

disease in these glands. The enlarged glands may also compress the ureter and cause ureteral colic with its typical signs, although there may be no enlargement of the glands at all.

Pancreatic cyst or carcinoma may cause dull, constant lumbar pains which are located on the left side in involvement of the tail and on the right side in involvement of the head.

Bilateral lumbar pains may occur in diabetes mellitus or insipidus. The causes may be overstraining of the already weak lumbar muscles, pancreatic disease, or renal involvement from the overactivity in polyuria.

Pains high up in the lumbar region on the right side may be due to cholelithiasis. These are atypical pains which are constant, except that they do not occur at night. The tenderness is higher up than in renal lesions, not reaching down so far as the tip of the twelfth rib. Biliary cirrhosis and carcinoma of the liver may occasionally cause such pains. These pains are especially increased when the patient stoops.

Bilateral lumbar pains which may be so severe that the patient is unable to walk may be due to *Addison's* disease. The pains are also present under both hypochondrial regions, either anteriorly or posteriorly, as well as in the lumbar region. The other signs of *Addison's* disease, such as chronic dyspepsia, asthenia, general weakness, arterial hypotension, and pigmentation of the skin

and mucous membranes, may also be present. Affections of the adrenals, such as tumor or bilateral or unilateral tuberculosis, may also cause such symptoms. We must think of adrenal disease in the presence of bilateral pain of the lumbar region which radiates upwards with signs of adrenal insufficiency and with no positive findings of renal disease. Renal succussion may be present, and tenderness along the ureter may also be found. There need be no wasting away in adrenal disease of any nature; on the contrary, the fatty tissue may be well preserved.

Unilateral pains in the left lumbar region, or, more accurately stated, in the left lumbar and flank regions, may be caused by affections in the bowel, especially at the splenic flexure. Pain may be present in this location in the flexure, as from a carcinoma, or the pain may be referred from some other place. Carcinoma causes a dull pain in the left flank. This part of the bowel may be the seat of pain which is caused by adhesions either posteriorly upwards with the diaphragm, or with the lateral abdominal wall. Adhesions will also produce tenderness in the region of the pain. Disturbances of the bowel movements, as constipation, diarrhea, or both in alternation, history of a possible cause as trauma, intra- or retroperitoneal inflammation, or serositis in some other location, as well as negative findings elsewhere, may lead to the diagnosis. Occult or man-

ifest malena usually means tumor in this region, but we must also remember that adhesions may produce this sign as a result of stenosis, perhaps intermittent, during which a distention or decubital ulcer develops in the bowel. Furthermore, in cases where the pain and tenderness are in the splenic flexure we may be dealing with a lesion lower down in the intestine, causing only distention pains at the splenic flexure. The X-ray will be of great value in the diagnosis of this condition.

The same remarks may be made relative to the hepatic flexure, except that the symptoms may here be mistaken for gall-bladder disease.

Chronic appendicitis may also be a cause for lumbar pain and is most commonly found on the right side, though occasionally localized to the left. It is only by the characteristic local findings of this disease that we are enabled to make a diagnosis. Chronic enlargement of the spleen or wandering spleen may also produce pain in the left lumbar region, especially if the patient is in the horizontal position.

We must think of distant causes for lumbar pains. Such are the constant pains due to fibrous contracted pleurisy with radiation of the pain even to the sacrum. This pain may be very moderate or there may be simply a disagreeable sensation in this region. Similar symptoms may be found in pleural irritation, adhesions, and tuberculosis

of the lungs, especially in the presence of an active process in the lower lobes. There is active tuberculosis in the majority of cases, and I believe the cause is a toxic action or reflex contraction of the lumbar muscles, as we may find tenderness on percussion or palpation of these muscles.

Neurasthenic spinal irritation may be found in ordinary sexual or traumatic neurosis. The patients complain of a continuous drawing or pressing pain which may vary in intensity, even producing severe pseudorheumatic pains in both lumbar regions with radiation to the sacrum. These patients often think that they are suffering from renal or spinal disease and complain of feeling as though their backs were broken. The diagnosis is made on the presence of neurasthenic stigmata and by exclusion of any organic disease.

Diseases of the spine such as marked kyphoscoliosis may cause intense pain on the convex side of the curvature. Affections of the cord, meninges, skin, and nerves may all cause lumbar pains. Lumbar pains may also be due to postural causes as in cases of flat foot. It must be determined if the muscular disease is primary or secondary to lesions in this vicinity.

## Pain in the Flanks

This chapter will deal especially with pains localized to the flanks. We must mention all the

affections of the renal pelvis, ureter, dystopic kidney, and periureteral tissues. The pains in disease of the renal pelvis may extend anteriorly from the flanks to the hypochondrium. The other findings have already been described.

The large intestine is a much more frequent cause of pain in the flank. The causes of intestinal colicky pains in the flanks may be simple intestinal colic of the ascending or descending colon or the more common colic due to stenosis.

High rectal stenosis may cause pains which are not definitely localized and may be felt anywhere along the large intestine, but the patient complains of tenderness in the left flank. This sign may be considered of the utmost importance in high rectal stenosis even in the absence of tenesmus or findings on rectal examination. The other signs, such as gurgling, stiffening, and peristalsis, may also appear and serve to distinguish it from ureteral colic with constipation, meteorism, and vomiting.

Recurrent colicky pains in the region of the descending colon may be due to colonic spasm. The X-ray is of value. A rubbery, hard, tender strand about as thick as a thumb may be found. Such a colonic spasm may be due to chronic nicotinism, primary disease of the intestinal wall, pericolitic adhesions, mucous colitis, foreign bodies in the bowel, sclerosis of the intestinal arteries, or general nervous causes. Such a

spasm may also be reflex as from intense gallstone or renal colic.

If a patient complains of a single acute transitory attack of pain in the flank, we must first think of a catarrhal colitis and then of an ulcerative process of the mucous membrane. The nearer the ulcerative process approaches the serosa, the more will the pain have a tendency to be continuous. We will also find local tenderness, constant gurgling over the region which is circumscribed, and often occult or manifest blood or pus in the feces. The X-ray will also be of value.

Acute exudative pericolitis may also occur, especially at the ascending and descending segments and at the flexures. The changes are similar to those found at the cecum or sigmoid flexure in similar changes at these places. These masses of exudate may regress and disappear in a few days, or, what is more rare, they may go on to suppuration. The condition is characterized by the onset of local pain at the site of the lesion, nausea, vomiting, fever, constipation, and occasionally diarrhea, except in those cases which develop on the basis of an ulcerative colitis. There is also a very tender, painful, round or cylindrical tumor which is smooth and dull or dull tympanitic on percussion, thus resembling a periappendical tumor. Such a tumor may develop and disappear in the course of a few days. The most severe degree of such a pericolitis is found in per-

foration of the bowel into the retroperitoneal tissue, usually the result of a tuberculosis of the large intestine.

Our knowledge of the pre-existing causative condition in the bowel, sudden onset, sudden and intense pain, septic fever, general condition of the patient, and the local signs of suppuration will lead to a diagnosis. It will be difficult to make a differential diagnosis between such a pericolitis, periappendicitis, and cholelithiasis unless a palpable exudate mass is present. This is especially the case in patients having periappendicitis with pains high in the right flank at the level of the navel. Such symptoms may also be caused by an appendix which is turned up anteriorly over the cecum.

We may have to deal with a serofibrinous, purulent, or phlegmonous inflammation of the retrocolic tissue, caused or possibly spread via the lymphatic system. Such a condition is more frequently found behind the ascending colon, less often behind the descending colon. The most common causes are inflammation of the female genitalia or periappendicitis, less often from inflammations of the male genital tract. In addition, inflammation of the retroperitoneal tissue may be caused by disease of practically all organs in the small pelvis or retroperitoneal organs, or by tumors or cysts of such organs as the kidney, pancreas, lymphatic glands, etc. Perforation of

any part of the gastrointestinal tract or gallbladder into the retroperitoneal tissues, or extension of diseases from the before-mentioned organs into the retroperitoneal tissues, may also cause these symptoms. Inflammation of the posterior mediastinum may extend downwards, and a similar process from below may travel upwards. The retroperitoneal tissues may also become primarily involved or may be secondary to diseases of the spine, ribs, pelvis, or muscles. Acute or subacute inflammation of the psoas muscle even without extension of the process may cause referred pains in the flanks and may be unilateral or bilateral.

If the inflammation and suppuration is localized behind the ascending colon, the pains are intense only when there is a localized abscess formation with bulging in the flanks. Here we find redness and edema of the skin over the involved area. The pains may be absent or be only of a mild oppressive nature if the exudate is serofibrinous or phlegmonous, or if the process extends upwards behind the kidney and forms a subphrenic abscess. The objective signs, when present, are slight flexion and adduction of the thigh, tenderness in the right flank, and tenderness only on very deep pressure, so that the examiner touches the posterior abdominal wall from the anterior surface before the sign is elicited.

Rheumatic myalgia of the psoas muscle may

cause pain in the flank with flexion and adduction of the thigh and the other usual symptoms of psoas abscess. The diagnosis can be made only on exclusion of all primary and secondary diseases in this region or psoas muscle, as well as by the presence of myalgia in the neighboring muscles.

Actinomycosis has the peculiar tendency to extend into the retroperitoneal tissue just as it does into the posterior mediastinum. It may extend along the spine or laterally along the iliac fossæ, thus imitating other inflammatory processes in this region. The suppurative process may even extend downwards to the lower extremities.

We may consider retrocolic phlebitis in the presence of phlebitis in the lower extremities with subsequent pain in the flanks and edema of the lower limbs.

Cholecystitis may cause such symptoms in low position of the liver or gallbladder or abnormal position of the latter to the right. We must also consider disease in the external portion of the right lobe of the liver, such as tumor, abscess, gumma, etc. Perihepatitis, disease of *Riedel's* lobe, retroperitoneal vein, nerve, gland, or muscle affection, and mesenteric cysts which are distinguished by the very marked and characteristic mobility, especially towards the lateral parts of the abdomen, must also be considered. We must

also think of disease of the iliac fossæ or organs located in this region, such as a loop of the small intestine, tumor of the bowel, dystopic and pathologically changed ovary, or even the uterus.

I wish to mention another cause for pain in the flank, even of colic, which may sometimes extend along the ureter and which may lead to the wrong diagnosis of appendicitis situated low down, or of a high ureteral colic. This is inguinal hernia. The examination of the inguinal canal, presence of an open ring, and disappearance of the pain upon application of a suitable bandage will clear up the diagnosis. Extreme local relaxation of the abdominal wall, as after a poliomyelitis, may give rise in this region to a hernia with severe colicky pains.

### Chronic, Continuous Pain in the Flanks

We find this type of pain in tumor and chronic inflammations of the intestinal wall and either the ascending or descending colon. This may be tuberculosis, syphilis, actinomycosis, etc. We may find such pains especially in tumors which have not as yet led to a stenosis of the bowel. This pain may also be caused by involvement of the glands in this area by tuberculosis, tumor, leucæmia, lymphogranuloma, or sarcoma, less often by syphilis or simple inflammation secondary to infection elsewhere. The diagnosis is made on the finding of a tumor mass, enlargement

of the glands elsewhere, or the presence of a primary cause which may extend to these glands.

The previously discussed pains in the lumbar region, caused by pressure on the spinal roots of the lumbosacral plexus, may also manifest themselves as pains in the flanks. These pains may be very intense or continuous, or they may show exacerbations. They may radiate to the genitals, testicles, or inguinal region, or to the thigh. The localized tender points already described, parasthesia, sensory and motor disturbances, especially in the area of the crural nerves, flexion of the hip joint, and the presence of a primary or metastatic tumor or other compressing cause of the nerve root will aid in the diagnosis. Disease of the lower ribs, spine, iliac bones, or even the femur may of themselves lead to pains in the flanks.

### Lumbar Pain in the Middle Line

In this section I wish to discuss pain in the middle line at the lumbar region and radiating to both sides. The patients usually refer to these pains as sacral pains.

We must first consider disease of the spine and nearby ribs, such as caries, syphilis, actinomycosis, neoplasm, infectious spondylitis, gonorrhea, osteomalacia, acute and chronic rheumatism of the vertebral joints, rhizomely, and *Kümmel's* disease. There are also affections of the spinal canal, as of the cord, meninges and disease of the

abdominal aorta, cœliac plexus or artery, retroperitoneal glands or tissues, pancreas, duodenum, mesentery, and, more rarely, renal or adrenal disease. Most of these conditions have been described in the chapter on mesogastric or sacral pain.

I wish to point out that a retroperitoneal inflammation, suppuration or phlegmon may extend upward from some pelvic affection but may occasionally arise from a subphrenic focus or medially from a paranephritis towards the spine, even crossing over to the other side. In renal disease the presence of pain in the median line and extending to both sides must make us suspect a diseased horseshoe kidney.

## Pain in the Left Hypochondrium

The chief cause of splenic pain is perisplenitis. The patients complain of pain or stitch in the left side on taking a deep breath, coughing, sneezing, or walking. Objective examination may reveal local tenderness in the intercostal spaces over the splenic region, and we may find a rub on auscultation and also by palpation if the spleen is enlarged. Such a perisplenitis may be the cause for pains in this region in leucæmia, polycythemia, syphilis of the liver, and pericholangitic cirrhosis of the liver. Perisplenitis is a common and dominating symptom for a limited period in the course of polyserositis when we find a perisplenitis without apparent cause.

Moderate pains or discomfort in the left hypochondrium are felt if the splenic capsule is rapidly stretched by increase in size of this organ. Such pains may be seen in acute infectious swelling of the spleen, as in malaria or typhoid, but is most marked in recurrent fever. It also occurs during the attack in paroxysmal hematuria, acute leucæmia, tuberculosis or syphilis of the spleen, and rapidly growing tumors of this organ, as in sarcoma, echinococcus, hemolytic icterus, etc.

The pains sometimes occur in chronic splenic tumor, as in the various types of splenomegaly or chronic typhoid or paratyphoid.

Splenic infarct may be followed by intense pains in this region, radiating towards the left shoulder, stomach, or left thigh. Chills and vomiting may be present. Since most splenic infarcts are caused by acute or recurrent infectious endocarditis, it is evident that suppuration may occur in some cases with resulting abscess formation. A strikingly long duration of the pains with a new exacerbation after the initial pain has begun to subside, general symptoms such as chills and fever and cytological and bacteriological as well as blood findings, will enable us to make the diagnosis of abscesses. Acute myomalacia of the heart may also produce splenic infarct, but the symptoms will be mild and will be due to the resulting perisplenitis rather than to the infarct itself. Such a pain of perisplenitis may be the first symptom of a cardiac lesion.

Other causes for splenic infarcts are recurrent fever, acute leucæmia and pyemia. Causes for splenic abscess are typhoid, pyemic metastasis, or extension from a neighboring organ.

Splenic infarct is the usual cause for pain in the splenic region in the presence of an acute infectious endocarditis. Rupture of a mycotic aneurism of a splenic artery, with bleeding into the spleen, or rupture and bleeding into the ab-

dominal cavity, may also cause pain in the left hypochondrium. The latter condition will be characterized by a sudden, overwhelming pain in the left hypochondrium, with radiation to the left shoulder, collapse, signs of acute internal hemorrhage, and usually appearances of dullness in the left side of the abdomen.

Rupture of the spleen may be caused by trauma, but a diseased spleen may be ruptured by a comparatively insignificant factor, such as coughing or straining. The diseases in which such a splenic condition may occur are typhoid, malaria, or recurrent fever. A localized hematoma may form if the rupture occurs in a previously walled-off space as observed by me in a case of polycythemia.

Torsion of a wandering spleen may cause such pains. They are very severe and are preceded by crampy pains in the left hypochondrium. There may be collapse, dysuria, and a palpable tumor or resistance in the left part of the abdomen. The enormous enlargement of the spleen in these cases is due to the torsion of the splenic vessels and resulting obstruction to the return flow of the venous blood. The most intense pains I have ever seen in the splenic region were due to total anemic necrosis of the spleen resulting from an erosion of the splenic artery by a carcinoma of the small intestine.

Hemolytic icterus may cause pains as a result

of tension of the splenic capsule or by the hyperactivity of the organ itself. We find moderate or severe colicky pains at varying intervals.

Sclerosis of the splenic vein may cause intermittent colicky pain, which may also be continuous and which is found in polycythemia and in some cases of splenomegaly. The pain may be the only symptom for years of a diseased condition of the hematopoetic system. Arterial aneurism of the splenic artery may also cause such pains. The process may be mycotic or arteriosclerotic in origin. The pains in the presence of arteriosclerosis may be due to infarcts in the spleen from dislodged emboli coming from the aneurismatic splenic artery.

Pain in the left hypochondrium may also be due to adhesions between the spleen and abdominal wall or stomach. Such adhesions can only be diagnosed by the location of the pains and by the presence of adhesions about the neighboring intestines as evidenced by the presence of intestinal stenosis colic.

New growths or inflammations in the splenic region, such as circumscribed peritonitis from the stomach, may cause pains in this region either by their mere presence or by extension in the spleen itself. Extension of a tumor or inflammation into the spleen will be identical with the picture produced by such primary condition in the spleen. We find the typical localization of the pains,

severe general course, local edema of the skin, and a secondary pleurisy on the left side. These pains are caused by thrombophlebitis of the splenic vein, multiple abscess formation in the spleen, erosion of the capsule, or growth through it into the splenic tissue itself.

Chronic pain in this region may occur as a result of stretching of the stomach wall after meals when there is an obstruction at the pylorus or duodenum. Periappendical suppuration may extend upward to the left hypochondrium and cause pain in this region.

Among the diseases of the colon which may produce pain in the left hypochondrium is carcinoma of the colon extending into the parietal peritoneum. Other possibilities are plastic colitis with adhesions in the splenic flexure which produce a very tender tumor mass corresponding to the shape of the colon, as well as nausea, vomiting, and fever. Severe ulcerative colitis may lead to pains in this region and is characterized by fever of long duration, often for a month, severe general symptoms, diarrhea and constipation, and almost constant presence of mucus, blood, or pus in the feces.

We must also consider the simple ulcer of the colon, pericolitis, stenosis of the splenic flexure from any cause, simple distention pain caused by a stenosis lower down in the colon, and adhesions. Such adhesions may be a result

of a peritonitis, as from appendicitis, or it may develop during the course of a subphrenic suppuration, pleurisy, etc. The diagnosis may be made on a history or presence of a possible cause, symptoms of stenosis colic of the intestine, and X-ray which may show a marked, acute-angled kinking of the splenic flexure with difficult or delayed passage of the contents. There may be flatulence or dilatation of the transverse colon or even a pulling up of the splenic flexure towards the spleen. The patients complain of increased pain on bodily motion or movements of the diaphragm as in coughing or sneezing.

Coloptosis may cause these pains by kinking, in the manner already described. In these cases, the symptoms are increased on bodily motion or shaking and are diminished by application of the proper abdominal support. Deep and glide palpation according to the method of *Haussmann,* as well as the X-ray, will clear up the diagnosis.

Similar pain has been observed in colonic spasm in the distal part of the transverse or descending colon, or even in the sigmoid. These pains may occasionally show a nocturnal tendency. Pains in the left hypochondrium, due to distention of the bowel by gas, will be relieved on passage of flatus.

Pains in the left hypochondrium may also be due to diseases of the left kidney, adrenal or tail of the pancreas as well as to disease of the retro-

peritoneal tissues. It is especially important to know that pains from the left kidney may be localized to or predominate in the left hypochondrium, extending even as far as the left border of the epigastrium under the left costal arch. The pains may radiate to the left thigh, and there may be hyperalgesia of the skin along the border of the left costal arch.

Pancreatic affections such as purulent and non-purulent disease, which may be primary or metastatic, as from an acute endocarditis, œsophageal or retroperitoneal disease, may cause similar pains, as may also the various affections of the stomach. Acute boring or cramp-like pains midway between the xyphoid and navel and extending from one costal arch to the other and into the hypogastrium, especially the left, occurs in acute pancreatic disease even if there is no evidence of previous pancreatic insufficiency. We may see premonitory, colicky pains which are mild and of short duration and which may exist for years before a precipitation of a real pancreatic attack with collapse, etc., occurs.

Liver or gallbladder colic may be located in the left hypochondrium, and the initial tenderness may also be there, but they eventually shift back to the right side. The pains may, however, be constantly present on the left side when there are accompanying adhesions with the stomach or omentum or if there is gastrospasm with re-

sulting gastric dilatation, and an accompanying affection of the pancreas.

Affections of the left lobe of the liver, especially those leading to enlargement of this part, cause pains in the hypochondrium, even more frequently than the diseases mentioned in the previous paragraph. Such affections are gumma, neoplasm, cyst, etc.

In the presence of pain located somewhat above the spleen and toward the diaphragm, we must consider a subdiaphragmatic suppuration or inflammation in the space bounded by the spleen, diaphragm, left lobe of the liver, and stomach. Such a subdiaphragmatic abscess may, for example, result from a pancreatic necrosis, or it may be the first localization of a tuberculous peritonitis. In the latter condition, the patient may complain of pain in the left hypochondrium coming on acutely, dyspeptic complaints and subfebrile remittent or intermittent fever, without other objective signs. Ascites and the other typical symptoms will eventually develop.

We must also consider affections of the diaphragm and of the diaphragmatic pleura, such as diaphragmatic hernia, eventration, or pleurisy. It is sometimes very difficult but important to differentiate a pleural from a splenic rub. This is best done by determining whether the point of maximum intensity is over the pleura or over the area of splenic dullness. If there are two

points of maximum intensity, we must consider a combination of pleurisy and perisplenitis. Location of the tenderness is also of great importance, as tenderness in the lower four intercostal spaces in the axillary line and extending below the costal arch points to the spleen as being the organ at fault. It must not be forgotten that a large spleen may cause compression atelectasis of the overlying lung with resulting râles which must not be confined with a perisplenic rub.

Constriction or compression of the intercostal nerves by the scar tissue in fibrous pleurisy may cause pains like those in diaphragmatic pleurisy. Other involvements of the intercostal nerves, such as genuine or symptomatic neuralgia or compression due to some other condition, may also cause such pains.

Traumatic hernia, diseases of the skin, muscle, connective tissue, etc., may cause pains in this region. For a discussion of these see the description of these lesions in the chapter dealing with pain in the right hypochondrium. Ptosis of the spleen or left kidney must also be mentioned.

## Bilateral Hypochondrial Pain

Our first thought in this case is colic of the colon, resulting either from some simple cause or from stenosis. In the latter instance, we must consider a stenosis of the splenic flexure. We must consider other diseases of the large intestine, such as colitis, carcinoma, etc., either at the transverse colon or at the flexures on either side.

*Addison's* disease, pelvic disease such as prostatic carcinoma which may cause severe pains radiating to both hypochondrial regions, and cholelithiasis or cholecystitis with pains in both hypochondrial regions, but with location of the objective findings in the right side, must all be taken into consideration. Bilateral hypochondrial pains may also be a symptom of affection of the pancreas; this may be diffuse or simply a stenosis of the lower end of the duct with limitation of the process to the head. Symptoms of pancreatic insufficiency as discussed in the chapter on pancreatic disease will make the diagnosis possible.

Such bilateral pains will also be present in acute infectious diseases, with acute or rapid enlargement of the spleen or liver and resulting

abnormal tension of the capsules. This is present in recurrent fever, Malta fever, and malaria. These pains have also been met with in hemolytic icterus and periarteritis nodosa.

Diaphragmatic trichinosis, neurosis, or overstraining, as in running, coughing, etc., may also cause such pains. Acute diaphragmatitis may occur in pneumonia or as an entity in itself. The patients complain of more or less localized abdominal pain which may be intermittent or continuous and which may be localized in the epigastrium or right hypochondrium and may easily be mistaken for a gastric ulcer or cholecystitis. We sometimes find girdle pains corresponding to the line of insertion of the diaphragm. The pains run from the front to the back, either on one side or bilaterally. We find a lagging or a portion of the diaphragm on inspiration if the process is localized, with an increase in the respiratory excursion in the thoracic part above the region involved. The X-ray will show limited excursion of the affected part of the diaphragm.

Affections of organs located bilaterally, as in bilateral nephrolithiasis, or tissues with a bilateral distribution, as in subdiaphragmatic pleurisy, may also be causes for bilateral hypochondrial pain. We must also consider affections of the intercostal nerves, muscles, and ribs as a possible cause of such pains.

## Pain in the Region of the Navel

We must consider disease of the navel itself, such as hernia, metastasis from elsewhere, and pains arising around the umbilicus or from nearby places.

Sudden, colicky pains around the entire circumference of the navel is a very common symptom in colics from the small intestine. We may have to deal with a simple colic from any cause, flatulent colic, or the result of *Schmidt's* fermentation dyspepsia. We must also consider lead and stenosis colic.

Colic due to disease of the colon may also be distributed around the entire circumference of the navel, especially if coloptosis is present. Such pains are found in dysentery, ulcerative colitis, and cholera; rarely in mucous colitis.

A nervous enteralgia may also be localized about the navel. The diagnosis will always be very difficult, as we can hardly exclude all the anatomical lesions, especially adhesions. On the other hand, the hysterical stigmata or psychic signs may be suggestive but are not conclusive. The fact that the attack ends with dysuria, urina spastica, the suggestibility of the patient, and

the hyperesthesia of the skin over the painful area, will speak for such a diagnosis.

It is well to remember that acute continuous pain around the navel may be due to appendicitis or periappendicitis. There are a great many cases in which the patient complains of very intense pains around the navel during the first two days; in other cases the chief area of pain is in the epigastrium and only later at the navel. In both instances, the pain finally wanders to the ileocecal region after one or two days. There are also comparatively rare cases of appendical involvement with pain which remains about the navel throughout the course. Chronic, dormant, or recurrent chronic appendicitis may cause recurrent pain or soreness about the region of the navel.

When a patient complains of apparently simple colic in the region of the navel, coming on three to four hours after meals and accompanied by marked constipation, loss of weight, and dyspepsia, we must think of chronic appendicitis. Multiple perisigmoidal adhesions resulting from periappendicitis may also cause pain around the navel. In addition to the symptoms already described for these diseases, we will also find pain in the navel region by pressure over the appendix and vice versa, as well as by inflation of the rectum.

Acute destructive appendicitis may cause pain

in the navel region by a wandering of the primary purulent appendical exudate along the preperitoneal tissue of the anterior abdominal wall to the navel region, finally forming an abscess or even a perforation in this region. Such a complication is more often observed in pneumococcic infection of the appendix or peritoneum, but has also been seen in puerperal and tuberculous peritonitis. In the pneumococcic peritonitis, pain around the navel need not be due to abscess formation, but may be the result of the accumulation of exudate in this region.

Perforation of the appendix may also cause sudden, overwhelming pain with or without shock. Perforation of the cecum or ileum, as in typhoid or tuberculosis, and a rupture or perforation of the stomach may cause pains around the navel. If there was a pre-existing gastroptosis, the localization of the pain around the navel is the rule.

Rupture of other organs in the free peritoneal cavity may also cause such pains. Ruptured extrauterine pregnancy or pyosalpinx are examples of such cases. Rupture of a thoracic aneurism into the œsophagus may cause cramps somewhat resembling the pain under discussion.

Disease of the mesenteric glands, etc., in the region of the navel may cause pain by producing a tearing effect of the mesentery. The same may be produced by a sarcomatosis of the glands or metastatic carcinoma in this region. Pains

around or below the navel, radiating especially to the lumbar region or under the ribs, in the presence of a known neoplasm of the abdomen, should be suspected as being due to malignant involvement of the mesentery. The pains may be intense, continuous or with exacerbations, and may be increased on stooping.

Tuberculosis of the mesenteric glands may also cause pains about the navel but especially above it. This process may be secondary to intestinal tuberculosis or it may be a primary disease of the gland itself. Tuberculosis of the retroperitoneal glands as well as non-specific inflammation of them may cause pains around the navel which radiate towards the symphysis.

Suppuration of the mesenteric glands, as in typhoid fever, may also cause such pains, and such suppuration may even lead to perforation peritonitis. Other affections of the mesenteric glands causing such symptoms are syphilis, leucemia, anthrax, and especially mesenteric cysts. The painful, colicky attacks in cysts may appear either with shock and intestinal occlusion or just as chronic dyspepsia with nausea, vomiting, anorexia, distention, and constipation. We occasionally find that these pains appear only on the patient's lying down and disappear while he is walking. The patients sleep on their abdomen. Similar symptoms may be due to tumors or cysts of the omentum. Incarceration in the foramen

of *Winslow* may cause a tearing effect of the mesentery, with pains in the umbilical region.

Affections of the omentum, such as tuberculosis, carcinoma, or circumscribed chronic, adhesive peritonitis of any origin, are followed by moderate dull pains or a sense of oppression about the navel, especially to the right, left, or above; much more rarely below the umbilicus.

Patients with vertical position of the stomach, as in gastroptosis or gastrectasy, will have pain around the navel in all affections of the stomach which are of a painful nature. There is also a type of gastric ulcer which is characterized by very intense, constant pains, sometimes with exacerbation, sometimes above the navel and radiating girdle-fashion around the abdomen, and but rarely localized to the epigastrium. In such cases we must think of a co-affection of the pancreas or cœliac plexus. In many cases the cause of such pains will be a perigastritis of the posterior wall of the stomach with adhesions to the pancreas.

Similar pains may be encountered in carcinoma of the posterior wall of the stomach. These pains may be used in consideration of a secondary pancreatic involvement only where we are certain that the stomach is in its normal position as seen by inflation or X-ray. Perforation of the stomach or duodenum may also cause pains immediately to the right or left of the navel. Duo-

denal ulcer may show a location of the pain in the region of the navel. The pain is to the right of the navel if the ulcer is in the cap; otherwise it may be located to the left.

Such pain may also be due to affection of a loop of small intestine, especially of a jejunal ulcer after gastroenterostomy. The latter condition should be suspected in the presence of heartburn, malena, and hunger pains after operation. Again, they may be the result of a stenosis of the upper part of the jejunum by a perijejunitis, a condition which can be diagnosed only by the X-ray.

In pain located just above the navel, we must consider the transverse colon as well as the stomach as a possible cause of these pains. The pains may be colicky and may represent the usual flatulent colic, or they may be symptomatic in inflammatory or malignant processes in stenosis colics. Isolated, nervous, spastic enteralgia is a rare cause for this pain. The latter condition may be recognized under the X-ray while watching the effect of papaverine and belladonna. Such pains may also be due to adhesions or fixation of an abnormally shortened gastrocolic ligament, a condition resulting from carcinomatous infiltration. The pains may be cramp-like and independent of food intake; there are alternating constipation and diarrhea, sometimes tenesmus and general dyspeptic complaints. The rare cases

of pericolitis will be characterized by a horizontal, tender, cylindrical tumor extending from one costal arch to the other with gurgling on palpation and other signs of acute colitis and pericolitis.

Periumbilical pains may also be due to disease of the colon rather distant from the navel, as, for example, in an abnormally long or distended sigmoid flexure in volvulus.

Pains somewhat to the right, left, or above the navel may occur in an attack of cholelithiasis. Such a location of the pain may result from a stone in the common duct. Dull pains in the same region are even more common and are due to a chronic obstruction in the lower part of the common duct. Similar pains may also be due to a perforation of the gallbladder by a stone into the duodenum with a wandering of the calculus in the small intestines. Acute cholecystitis or tumor, with or without stone in the gallbladder, may cause pain in this region if the gallbladder is enlarged or pulled down by adhesions. Tumor, gumma, cyst of the liver, or painful liver as in passive hyperemia, may produce such pains in the umbilical region, especially if there is an abnormally low position of the liver.

Unusual enlargement of the spleen, especially if associated with perisplenitis, may also cause such pains in this region. Affections of the pancreas cause pain midway between the navel and

xyphoid, but they may occasionally be located directly above the navel. These pains may be due to irritation of the cœliac plexus and may be the only sign of involvement of the pancreatic tissue. This may especially occur in carcinoma or gumma of the pancreas.

Acute pancreatic affections, either hemorrhagic or necrotic, as well as pancreatic cysts, may lead to similar intermittent pains above or around the navel. We find pains in chronic pancreatitis around the navel appearing about one hour after meals, remaining two to four hours and ending with vomiting.

There are two conditions which produce pains similar to those found in pancreatic disease; these are neuralgia of the cœliac plexus and tabetic crisis. Affection of the cœliac plexus is described on page 153, etc. The differential diagnosis between pancreatic disease and tabetic crisis may be very difficult, as similar pains with intervals between the attacks occur in each and there may be a syphilitic history and irregular pupils in syphilitic disease of the pancreas. Pancreatic disease may be recognized by the presence of a tumor in the pancreatic region and by the fact that the patients have a sensation of discomfort even during the intervals, while the tabetic is free from all disturbances during these intervals, except, perhaps, for occasional constipation. The attacks of tabes are of about the same intensity

throughout, while pancreatic disease as carcinoma shows marked remissions during an attack.

Renal conditions may cause pains which are located somewhat to one side of the navel, especially where the organ is enlarged and situated low down. Ureteral pain, caused by the passage of a stone, gravel, or crystals, may also cause pain in this region. Bilateral pains in these ureteral cases may be due to a bilateral involvement or they may be caused by a uretero-ureteral reflex. In these ureteral cases there may be no skin hyperesthesia or pain on deep pressure over the lumbar region.

We must think of the possibility of a horseshoe kidney either in its usual or pathologically altered state. The pains in this condition are sometimes increased on bodily motion or bending of the body either backwards or forwards. The patients complain of digestive disturbances which are caused by compression of the intestines. There may be a palpable tumor in the lumbar region, and the X-ray examination may be of diagnostic value.

Affections of the abdominal aorta or its larger branches, as in sclerosis, syphilis, or aneurism, may be a cause for such pains in the same manner that any other retroperitoneal organ or tissue may be a cause for such pain. All these conditions cause a sensation of pain located deep in the abdomen, almost in the back. The diagnosis of

aortic sclerosis will be made on the tenderness of this vessel on pressure, the fact that this vessel runs with a curve to the left instead of straight down, the presence of a marked and enlarged area of pulsation which may be seen even in the back, increased blood pressure in the arteries of the lower extremities as compared with those of the upper, cystolic murmur over the aorta without pressure of the stethoscope, and palpation of the areas of calcification and deposit when possible. The pains, especially in the luetic conditions, are easily produced on the patient's walking or standing and quickly disappear on his lying down. Aneurism of the abdominal aorta may cause pain above the navel region and it may extend towards the epigastrium. The pains are said to be increased when the patient is on his back or when he changes his position in bed.

Sudden thrombosis or embolus in the abdominal aorta may cause very intense, sudden pain which is usually localized somewhat below the navel and perhaps radiates towards the lower extremities. The diagnosis will be made on the presence of a possible causative disease, and on signs of arterial ischemia in the lower extremities, such as the appearance of a small pulse or even complete disappearance of it in the lower extremities, followed finally by asphyxia or even gangrene in the lower limbs, motor and sensory paralysis of the lower extremities, disappearance of the knee

jerk, and appearance of anuria or urinary retension.

Thrombosis of the mesenteric vessels or thrombosis of the portal vein with incomplete obliteration of the lumen may cause pains above the navel and produce intermittent, colicky attacks if the process is only temporary. Affection of the portal vein is characterized by the appearance of signs of portal stasis.

Periumbilical pains may be a center where girdle pains concentrate. Spinal nerve disease may be a cause of such pains.

Changes in the abdominal wall may also produce pains in this region. Such conditions are umbilical hernia and diseases of the wall or fatty tissues in this region as in adiposa dolorosa.

## Pain in the Hypogastric Region

The first consideration in cases of either continuous or intermittent pains in this region in female patients is disease of the female genitalia. These diseases may cause motor intestinal disturbances, and we must remember this fact when such disturbances occur during menstruation. In view of the above-mentioned close association of the genitalia with the lower segments of the bowel, we must also consider genital disease if the pains from the genitalia are increased during the bowel movements or intestinal activity in the lower part of the tract.

I also wish to mention the rather rare occurrence of uterine colic in tabes. These colics may resemble labor pains and may remain for several minutes.

We must, furthermore, consider inflammatory, ulcerative, and neoplastic conditions of the bladder or foreign bodies or stones in this region. The ultimate diagnosis will be made on cystoscopy and examination of the urine. Bladder pains and tenesmus are also observed in patients with considerable urinary sediment such as phos-

phates, oxalates, or urates. These pains may radiate to the back, and there may be a burning pain in the urethra itself. An abnormal urine, even in the absence of cystitis, may be followed by pains in the bladder, as, for instance, after the use of methylene blue or in hematoporphyrinuria. We find suprapubic pains in the latter group of cases.

The most severe and continuous pains in the bladder region occur in severe diphtheritic, gonorrheal, tuberculous, or carcinomatous disease of the bladder. Simple cystitis is followed only by burning on urination and tenderness over the bladder. Carcinoma of the bladder may be primary or, more often, it may be secondary by extension from the uterus, prostate, sigmoid, or rectum. Perforation of a rectal or uterine carcinoma into the bladder is not rare. In these cases a careful palpation per rectum or vaginam, as well as cystoscopy, will help in the diagnosis.

Foreign bodies in the bladder, such as stones, cause pains which practically completely disappear on the patient's lying down, to appear on brisk bodily motion. Bleeding from the bladder, palpation with the sound, the characteristic interruption on urination, and the cystoscopic and X-ray findings will all tend to confirm the diagnosis in these conditions.

Such pains may also occur in a normal bladder if it is very much distended by a very large

amount of urine. Rupture of the organ causes a very intense pain in the hypogastric region and shock. These pains may even extend to the epigastrium or to the region of the heart. We sometimes find a painless interval between the pain due to the previous distention and that due to the rupture itself. Such a perforation will be followed by a diffuse peritonitis if the rupture is intraperitoneal or by a circumscribed urinary extravasation if it is extraperitoneal. Acute distention of the bladder is common in acute congestion of a chronic prostatic hypertrophy. Such an acute distention may be the first sign of a prostatic hypertrophy in patients who were apparently in a good state of health.

Similar pains above the symphysis may be due to an inflammation of the peritoneal covering of the bladder, pericystitis, or involvement of the perivesical tissue, called paracystitis, under the peritoneum. These processes may result from primary bladder disease caused by stone, stricture, prostatic disease, or affection of other abdominal organs in the vicinity of the bladder. Of first importance in the latter group is periappendicitis, especially those cases in which the appendix is located on the promontory of the sacrum or where the appendix hangs down in the pelvis. Pains and painful tenesmus may be present in these cases. On rectal and vaginal examination we often find a marked tenderness in the right

side or posterior part of the pelvis or a doughy resistance around the rectum.

Acute perisigmoiditis may cause pains at the symphysis of itself or indirectly through the complicating paracystitis or pericystitis which it produces. Such pains may also be present in pericolitis or in involvement at the hepatic flexure in coloptosis. Pericystitis may be but a part of a peritonitis extending to the pelvis.

Pains in the bladder region or tenesmus, pains during and after urination, and dysuria are often early symptoms of an acute peritonitis. A perforative peritonitis, even from the stomach or duodenum, may cause tenderness in the bladder region in the early stages.

Acute pericystitis may also be a part of a pelvic peritonitis arising from the female pelvis, rectum, sigmoid, perirectal tissue, bony pelvis, or spine. We find pains above the symphysis in these cases, after diffuse abdominal pains have already been present over the entire abdomen. Fever, rectal and vesical tenesmus, and a palpable exudate mass extending above the symphysis even as far as the navel may also be present. The rectum may discharge much mucus as a result of the venous stasis caused by the compression by the mass of exudate.

Adhesions about the bladder will be manifested by pains in this region, sometimes crampy or simply tearing or bearing down in nature. Pain-

ful tenesmus may be the only sign of this condition. The pains sometimes occur during urination or distention of the bladder. Both types may be explained by a tearing or pulling of the adhesions either during the contractions or during overdistention of the bladder. Adhesions connecting the bladder with the rectum or uterus will cause vesical pain with simultaneous intestinal colic or dysmenorrhea.

Painful tenesmus with or without radiation in the pelvis may be purely reflex and is due to a cramp of the bladder sphincter. The patient may be able to pass only a few drops of urine, or there may even be complete retention. Such a reflex cramp of the bladder sphincter may be due to diseases of the bladder itself or of the organs in the vicinity. It may be present in concentrated urine, in bacteriuria without cystitis, or after the intake of large quantities of fresh beer or wine.

We must consider the possibility of a thrombosis of the venous plexus of the bladder or of the pelvis in the presence of venous stasis, as in hepatic cirrhosis. Sclerosis of the abdominal aorta or its pelvic branches may sometimes cause severe tenesmus, faintness, weakness, and anxiety. These pains appear during bodily motion or excitement and disappear when the patient lies down.

Of still greater importance is the fact that diseases of the upper urinary tract may cause reflex

pains in the bladder region. Such bladder manifestations may be an early symptom of a renal tuberculosis, and we must not forget to look for the primary source in cases of tuberculous cystitis.

Renal or uretral stone may also cause bladder pains, and the lower the stone the more severe will be the attack. The passage of crystals or gravel may cause pain in this region. Pyelitis, especially the acute type, in pregnant women may cause bladder symptoms. The differentiation from acute cystitis is made on the local lumborenal findings, a urinary sediment showing epithelial cells from the renal pelvis, leucocytes, fat, bacteria, and the results of cytoscopy.

Pains in the hypogastrium, extending upwards towards the navel or downwards to the groin, is found in retroperitoneal lymphadenitis or lymphangitis arising from some inflammatory process elsewhere. Moderate edema of the lower extremities may be present in which the wrong diagnosis of phlebitis of the iliac vein may be made, though in the latter condition the pains are located in the iliac rather than in the hypogastric regions. Dysuria may also be observed in inguinal hernia. We must also consider psoas abscess or disease of the bony pelvis as a cause of bladder symptoms.

Osteomalacia and acute rheumatism of the synchondrosis symphysis must be kept in mind. The diagnosis will be made on the presence of pain in the middle of the lower abdomen which is greatly

increased on walking, marked tenderness on pressure over this region, and the fact that pains are very much increased on abrupt abduction of the thigh. Low fever may be present, and the signs of rheumatism both here and in nearby joints may be favorably influenced by salicylates.

Caries, osteomyelitis of the pubic bones and posttyphoid periostitis must be mentioned, as well as painful attacks occurring during attacks of tertian malaria. Pathological changes in the abdominal walls is rarely a cause for pain in this region except in urinary extravasation.

We may consider nervous causes for such pain only after excluding all the above-named organic conditions. Such nervous conditions are vesical crises in tabes with intense colicky pains in the bladder and urethra or a sensation as if a foreign body is present in the bladder or urethra. The attacks may be moderately severe, and the patients may complain only of a cutting sensation in the bladder and urethra on urination. Frequent urination with painful straining may also be observed. There is a painful tenesmus of the sphincter with retention in other cases. Very characteristic are lightning-like sticking pains in the bladder, with radiation to the rectum. The patients remain in bed and feel as though the pains throw them to the ground when they get up. These bladder symptoms may come in the early stages of tabes, in which cases the diagnosis

is difficult. The other signs of tabes will be useful in the later stages of the disease. General paresis, luetic meningitis, multiple sclerosis, and diseases of the cauda equina may also cause such bladder symptoms. The bladder symptoms may even temporarily predominate in some of these cases.

Sciatica and polyneuritis may occasionally cause bladder pains. A condition which was not formerly recognized as a cause for bladder pains is disease of the pudenic plexus. There are tenderness of the bladder, painful tenesmus, pain on urination, and, especially, hyperesthesia of the skin supplied by this plexus. This area resembles a rhomboid on the perineum with one point on the symphysis and the other at the anus and laterally along the inner surfaces of the thigh. The urinary findings are negative.

Neurasthenia, hysteria, and the various neuroses may also cause such bladder pains in men with sexual neurasthenia or old gonorrhea. Females with asthenic habitus have these symptoms with burning on urination and painful tenesmus due to hypersensitiveness of the sympathetic plexus.

A special type of neurosis is the so-called irritable bladder. It is characterized by frequently repeated or even continuous tenesmus with radiating pains to the urethra, perineum, anus, or coccyx. The pains are particularly severe in the urethra and neck of the bladder. We nearly al-

ways find frequent urination, but it occurs only during the day. There may be tenderness over the bladder on both very superficial and deep pressure. We must always exclude organic disease such as fissure or erosions of the neck of the bladder, or similar conditions in the rectum or anus. Hypogastric pains also occur in men practicing coitus interruptus, disappearing after the resumption of normal sexual relations.

The true hysterical, hypogastric pain is characterized by the fact that there is tenderness over the ovaries on deep pressure where no anatomical disease really exists. Such pains may be pressing or burning and may continue for even a month. They are limited to the bladder or they may extend farther out laterally. There is exquisite tenderness when a fold of the skin is lifted. There may also be anesthesia of the skin over this area. The usual hysterical symptoms are generally present in these cases, as well as the inconstancy of the symptoms and susceptibility to suggestion. It must not be forgotten that a minor anatomical change may cause exaggerated symptoms in hysteria.

# APPENDIX

In the previous discussion, the subject of pain was discussed according to its location, but in this chapter the attempt will be made to discuss abdominal pain from the point of view of its character.

## Radiating Abdominal Pain

Distinct radiation of abdominal pain to the chest, especially in the region of the shoulders, points to disease of the liver, spleen, stomach, and duodenum as well as to thoracic disease. It is also seen in gastric crises, adrenal disease, and occasionally renal affections. Disease of the pancreas, cœliac plexus, and typical cases of gastric crisis show a radiation of the pain downwards, even reaching the genitalia or lower extremities. The radiation alone must not be given decisive weight, as one may sometimes find a typical radiation in cholelithiasis if it is associated with enteroptosis. Pancreatic disease and periappendicitis with infection in the region of the porta hepatis may occasionally cause pain which radiates upward.

Radiation to the testicle with tenderness of this

organ is characteristic of pain arising in the kidneys, its pelvis, or ureter and does not occur in gallbladder disease unless it is complicated by a pelvic peritonitis. This radiation may occasionally occur in extrarenal conditions, as in affections of the sigmoid, hernia, disease of the retroperitoneal glands or cœliac plexus, and occasionally appendicular pains.

Epigastric pains radiating to the left hypochondrium occur characteristically in gastric ulcer, but such radiation also occurs in gallstones with occasional limitation of the pain to the left hypochondrium and radiation to the heart.

## Relation of Abdominal Pain to the Intake of Food

It may again be emphasized that pain related with the intake of food need not always be associated with a lesion of the gastrointestinal tract. We find such a correlation in affections of the liver, gall ducts, pancreas, kidney, and even the spleen. There need even be no adhesions of these organs with the gastrointestinal tract.

Pain arising soon or immediately after food intake need not be associated with disease of the stomach, as it may also occur in disease of the appendix, cecum, or sigmoid flexure. This phenomenon may be explained by a reflex activity of a distant portion of the gastrointestinal tract upon activity in an upper segment. On the other

hand, pains four to eight hours after meals do not necessarily point to disease of the lower part of the gastrointestinal tract, as such a long interval may occur in motor insufficiency of the stomach, in perigastric adhesions, or in gastric contractions after the stomach is already empty. We also find such delayed pains in affections of the duodenum or jejunum, as the pains will not appear until these segments are well filled.

### Abdominal Pain During Defecation

Such pains may occur before, during, or after defecation and may then gradually disappear. These pains occur in affections of the anus or rectum or in lesions which extend up to the sigmoid flexure. Abscess or peritonitis of the pelvis, adhesions and tumors of these regions, and disease of the female genitalia may cause such pains by extension into the sigmoid or rectum. We must also remember the tabetic anal crises. Tumors in the vicinity of the cœliac plexus and even aneurism of the abdominal aorta may cause colicky pains before and after defecation.

If a patient complains of pain on defecation, in which the location of the pain varies, we must then consider catarrh of the colon with possible extension to the small intestines. Such cutting pains may occur in the transverse colon or in the sigmoid flexure in cases of mucous colitis.

Such pains are also observed in spastic con-

stipation. Ulcerative conditions and carcinoma of the intestines increase the pain during defecation as a result of the increased peristalsis. Chronic exudative peritonitis causes abdominal pains especially before defecation. Pains connected with defecation are very often due to adhesions, simple, inflammatory, tuberculous, syphilitic, or neoplastic in nature. This is not the rule in chronic appendicitis. We must remember that disease of any nature or organ may produce pains during defecation as a result of strain or contraction of the abdominal muscles during the act.

All these conditions may be associated with pains after an enema. Nervous people may complain of nervous tenesmus even after moderate filling by an enema. Such pains are especially present in spastic constipation, because the fluid tends to dilate the spastically contracted loops. Distention of the cecum may also cause pain after an enema and may even simulate appendicitis. An enema may also cause a reflex secretion in the stomach in cases of gastric or duodenal ulcer and may cause pain to appear in the usual areas for these diseases.

### Abdominal Pain Associated with Bodily Motion

We think of peritoneal adhesions, then of arteriosclerosis of the abdominal arteries, abdominal

aneurism, angina pectoris, hernia, renal stone, wandering organs, and occasionally of gastric ulcer in this type of pain.

### Abdominal Pain Associated with a Sensation of Anxiety

We have to mention intestinal obstruction, acute pancreatitis or necrosis of this organ, acute peritonitis, angina pectoris abdominalis, and the general group of diseases associated with collapse, such as gallstones or nephrolithiasis.

### Abdominal Pain Associated with Obstipation

We are accustomed to associate pain and obstipation with diseases of the gastrointestinal tract. We also find such symptoms in stone in the biliary or renal tracts, arteriosclerosis of the abdominal arteries, and angina pectoris. An attack of the latter often ends with belching.

### Abdominal Pain Associated With Menstruation

I wish to emphasize the fact that pains or increase in abdominal disturbances which appear or increase during menstruation are not always associated with disease of the female genitalia or with primary or reflex condition. Many anatomical conditions may regularly show symptoms at the time of menstruation. Such symptoms may be due to chronic appendicitis, adhesive perisig-

moiditis, nephritis, nephroptosis, pancreas disease, and sometimes sclerosis of the abdominal arteries in young people.

In regard to hysteria as a cause of abdominal pain I wish to say that we should not make this diagnosis unless all organic causes have been ruled out, especially when there are hysterical stigmata and anatomical lesions side by side, as any organic lesion may in itself be the factor causing an outbreak of hysterical symptoms.

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*(After the words in parenthesis add the word "pain" or "region," as the case may be.)*


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